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JANUARY, 1899. VOL. XIII. NO. 1.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

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NOTICES.*

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Afternoon Meeting.—Friday, January 27. On the Sub-Oceanic Physical Features off the Coast of Western Europe, including France, Spain, and Portugal. By Professor Edward Hull, LL.D., F.R.S., F.G.S.

Any Fellow resident in this country, desiring to have notice of the subjects of papers to be read at the Society's Meetings forwarded to him, can receive such notices by post on payment in advance to the Chief Clerk, at 1, Savile Row, of 2*s.* per session.

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* See also pp. vi. and viii.

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The Society has no office expenses to meet and no salaries to pay; and all editorial services are rendered gratuitously. Consequently, the whole of the money received from subscribers is expended in the preparation of publications.

The subscription (one guinea in England, five dollars in America) should be paid to the Society's Bankers on the 1st January in each year. This entitles the subscriber to receive, free of charge, the current publications of the Society. Usually two volumes have been issued each year; but it is hoped that for the future it will be possible to publish three volumes annually. Members have also special privileges in the purchase of back volumes. It may be mentioned that the publications of the Society tend to rise in value, and those which are out of print are now only to be obtained at high prices.

For 1899 it is proposed to issue :—

I. & II. THE EMBASSY OF SIR THOMAS ROE TO INDIA, 1615—19, as told in his Journal and Correspondence, edited by the Secretary from Brit. Mus. *Addl. MS.* 6115, and documents in the India and Public Record Offices.

III. THE VOYAGE OF SIR ROBERT DUDLEY TO THE WEST INDIES AND GUIANA IN 1594, edited from Brit. Mus. *Sloane MS.* 358 by George F. Warner, M.A., F.S.A., Assistant Keeper of Manuscripts.

In 1900 the following will probably be given :—

I. THE STRANGE ADVENTURES IN GUINEA OF ANDREW BATTELL OF LEIGH, edited by Ernest G. Ravenstein, F.R.G.S.

II. THE JOURNEYS TO TARTARY OF JOHN OF PLANO CARPINI AND WILLIAM OF RUBRUK, translated and edited by H. E. the Hon. W. W. Rockhill, United States Minister at Athens.

III. THE FIRST VOYAGE OF ALVARO DE MENDANA TO THE SOLOMON ISLANDS, 1568, edited by the Lord Amherst of Hackney and Basil H. Thomson.

Amongst other volumes in preparation are :—

THE DISCOVERIE OF THE EMPIRE OF GUIANA, by Sir Walter Raleigh, edited by Everard F. im Thurn, C.M.G.

THE FIRST ENGLISH VOYAGE TO JAPAN, 1611—14 edited from Captain Saris's original journal, by H. E. Sir Ernest Satow, K.C.M.G., British Minister at Tokio.

THE JOURNEY OF PEDRO TEIXEIRA FROM INDIA TO ITALY BY LAND, 1604-05, translated and edited by W. F. Sinclair, late I.C.S.

THE VOYAGES OF CADAMOSTO THE VENETIAN ALONG THE WEST COAST OF AFRICA, 1455-56, translated from the earliest Italian text of 1507 and edited by H. Yule Oldham, M.A., F.R.G.S.

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The
Geographical Journal.

No. 1. JANUARY, 1899. Vol. XIII.

THE PRESIDENT'S OPENING ADDRESS, SESSION 1898-99.*

In opening the Session, I propose to refer to the progress of geographical work since we last met, and to dwell more especially on the outlook as regards the prospects of antarctic exploration; for that must be the point of chief interest, not only to geographers, but to men of science generally, until the work is done.

I would first, however, congratulate the Society on the unusually large increase to our numbers which has just been announced, and which must be looked upon as an auspicious commencement of our Session.

In Africa there has been considerable activity among travellers, chiefly with a view to connecting earlier work, and making supplementary surveys; although the diligence of our explorers has, in some cases, led to new discoveries. Major Gibbons is continuing his exploring work in the region of the upper Zambezi; and Mr. L. A. Wallace has made a complete circuit of Lake Rukwa, and has ascertained the character of its drainage. Mr. J. E. S. Moore, assisted, I believe, by grants from the Royal Society, has already investigated the remarkable fauna of Lake Tanganyika; and his researches will throw light on the changes which have taken place in the land conformation of Central Africa. This observant traveller is now arranging to undertake the further investigation of Lake Tanganyika and the region around its shores, as well as the exploration of the almost unknown stretch between the north end of Lake Tanganyika and Lake Albert Edward. The officers in Uganda have continued to give their attention to the geography of that region. We have received a report from Lieut. Claud Hobart, of the Grenadier Guards, respecting the discovery of a lake by him to the west of the Victoria Nyanza. Captains Kirkpatrick

* Read at the Royal Geographical Society, November 14, 1898.

and McLoughlin have examined Lake Kioja, and ascertained that it extends much further to the east than is shown on the maps; while Major Macdonald himself, using the Society's instruments, is making an important survey from Uganda to Lake Rudolf. He has already reported that he has ascertained the nature of the drainage from Mount Elgon towards the Nile. Turning to Eastern Africa, we have been glad to hear of the safe return of Lord Delamere from his adventurous sporting journey in and beyond Somaliland; and we regret that the exploring zeal of such promising young travellers as Cavendish and Carnegie should have been checked for political reasons. Hence the valley of the Sobat, and the region between Lake Rudolf and the Nile, still remain to be discovered. Captain Wellby is now on his way to the country on the south-west of Abyssinia.

French explorers have been active in various parts of Africa, but not always in the pursuit of pure geography. M. Foa has executed a large amount of valuable surveying work in the region of the lakes and in the eastern part of the Congo territory; and M. Foureau has been indefatigable in his efforts to clear up the geography of the less-known parts of the Sahara. It was in November, 1897, that M. Gentil reached Lake Chad; but it is only recently that we have received any details of his topographical work, chiefly on the river Shari. On the Mobangi (or Ubangi), M. Liotard has extended the exploration of this great tributary of the Congo, which was commenced by our Gold Medallist, Mr. Grenfell. Under his auspices, Major Marchand's expedition was sent to the upper Nile. No detailed account of the results of Major Marchand's work has yet reached us. He appears to have ascended the Mbomu, an affluent of the Mobangi, and thence to have made his way to the Nile basin, launched his steel boats on the Sue, and, descending that river into the Bhar-el-Ghazal, arrived at Fashoda this summer. Scarcely any of this route is over new ground, as previous explorers had traversed most parts of the Egyptian province of Bhar-el-Ghazal, and extended their journeys as far as the Welle river. The interesting part of Major Marchand's journey will be his descent of the Sue tributary of the Bhar-el-Ghazal, which to a large extent is new.

The Bhar-el-Ghazal province was first explored by Schweinfurth, who gave a detailed and most interesting account of the tribes inhabiting that region, and of his visit to the Niam-niam country. Then followed the expulsion of the slave-traders, and the establishment of the Bhar-el-Ghazal as an Egyptian province; while Fashoda has been a station of the Egyptian Government for thirty years. The Bhar-el-Ghazal has been described in the works of Gessi Pasha and of Junker, and we have published two maps to illustrate the paper of Dr. Junker and the letters of Lupton Bey. It is not, therefore, necessary to issue another map of the Egyptian province of Bhar-el-Ghazal in the absence of fresh material.

It is interesting to remember that only forty years ago, all this vast region of the valley of the upper Nile was unknown. Its discovery was due to the advocacy and encouragement and to the large expenditure of the Royal Geographical Society, without which Speke, Grant, Petherick, and Baker could not have achieved their great successes in this region. To this Society belongs the credit of having brought the equatorial lakes and the upper Nile to the knowledge of the civilized world.

Turning from Africa to Asia, I have to report that Captain Deasy, who has gone through a course of study, and has been supplied with instruments by the Society, was at Khotan in May, when we last heard of him, having fixed the longitudes of Yarkand and Khotan by chronometer. Mr. Savage Landor returned from his attempt to reach Lhasa by the Tsanpu valley last spring; and he has already published the narrative of his sufferings at the hands of the Lamas, who appear to have become quite savage in their determination to exclude foreigners from their country. This was not always the case. Nothing could exceed the courtesy and hospitality with which the monk Desideri, who adopted the same route as Mr. Savage Landor, was received by the Lamas in 1719, and the envoys of Warren Hastings received a similar welcome in 1775 and 1783. Clearly the Tibetans have degenerated, owing to causes arising from their isolation, during the intervening century. Mr. Savage Landor has raised a question whether there is a stream connecting the Mansarowar and Rakastal lakes, which is shown on the Lama map, and on that drawn by Mr. John Walker for General Cunningham's work on Ladak in 1854. The subject is discussed by Captain Henry Strachey in the *Journal* of the Asiatic Society of Bengal, who saw and crossed the stream in question, while his brother Sir Richard also saw it, where it leaves the Mansarowar lake. There can be no question, however, that Mr. Landor was the first Englishman, though not the first European, to penetrate into the valley of the Tsanpu by way of the Marian-la. The same route was travelled over in 1719 by Desideri, who reached Lhasa without hindrance. One of the most interesting pieces of geographical work that remains to be achieved in Central Asia, is the detailed examination of the great chain of mountains bounding the Tsanpu valley on the north. I have called it the *northern Himalayan chain;* Mr. Brian Hodgson gave it the name of *Nyen-chen-tangla*, and Mr. Trelawney Saunders suggested the *Gangri* range; but no name has been adopted, and the mountains are practically unknown. It would certainly be most imprudent to approach them from the Tsanpu valley in the track of Mr. Savage Landor, but I do not think that they would be found to be altogether inaccessible on the northern side. Fortunately, we have several young aspirants for fame to be acquired by Central Asian travel and exploration.

From the islands of the Eastern Archipelago and the Pacific we anticipate fresh and interesting information during the coming session.

Three young American explorers, Dr. Hiller, Mr. Harrison, and Mr. Furness, have returned after having pushed far into the dense forests of Northern Borneo; our old friend and associate Dr. Forbes has set out to explore Sokotra; Mr. Andrews will tell us of his sojourn on the virgin Christmas island; and Mr. Christian has been resident for some time in the Caroline islands. We have had no account of that little-known group since Admiral Cyprian Bridge's paper was read in April, 1886—a memorable occasion, because it was the first time that lantern slides were ever exhibited in this hall.

From North America we shall have accounts of the search for Mounts Hooker and Brown in the Canadian Rocky mountains, and of the ascent of the almost unknown Thaam river from Hudson's bay by the Rev. J. Lofthouse. In South America, Sir Martin Conway has been undertaking the ascent of the two loftiest peaks in the Bolivian Andes, Mounts Illimani and Illampu; and I have some hopes of a paper on the Argentine-Chilian boundary question, by Don Carlos Pellegrini, the former President of the Argentine Confederation. But as a result of the study of accumulated stores of South American exploration and research, I would particularly call attention to Colonel Church's admirable address in opening Section E of the British Association at Bristol this year. The subject of which Colonel Church treats is the evidence of the existence of an ancient Pampean sea, covering all the plain country of the present Argentine Republic, and of a great Mojos lake to the northward. Colonel Church's address is an example of the uses to be made of the work of explorers by an able and thoughtful geographical student. The collected facts are well arranged, the arguments are clear and convincing, and the conclusions are alike interesting and important from the point of view of the evolution of physical geography. Our associate, however, is himself an explorer as well as a student.

Oceanography is receiving its share of attention. The Prince of Monaco read to us, last session, a most fascinating paper on the results of his comprehensive researches in the ocean depths; and this season he has been at work, in his yacht, in the northern seas. It was with very great pleasure that I received a letter from the Swedish Minister last April, announcing that our Admiralty has been asked to join in the excellent scheme proposed by the Swedish Hydrographic Commission. It consists of the organization of a common plan for research into the chemical, physical, and biological conditions of the water in the North Atlantic, North Sea, and Baltic, especially with regard to fishing interests, to be undertaken jointly by Great Britain, Norway, Denmark, Sweden, and Germany. A resolution was passed at the International Geographical Congress in 1895 approving of the scheme; and Prof. Pettersson has explained that a knowledge of the currents in the upper layers of the sea, and of the food they contain, is necessary for an intelligent organization of the fisheries, so that the undertaking would

be one of practical utility. I sincerely trust that our Government will agree to take part in so excellent and useful a project. Under the leadership of Mr. George Murray, of the Natural History Museum, and partly aided by our Society, an expedition has started for the exploration of the intermediate depths of the ocean between England and the Canaries. Soundings and observations of the bottom will also be taken.

The Germans have taken a very noble initiative with regard to oceanography. When Prof. Carl Chun, of Leipzig, proposed the equipment of a German deep-sea scientific expedition, he received the liberal support of an enlightened government. The German parliament voted a sum of £15,000, and there will be additional grants for publishing the results. A steamer of the Hamburg-American line, the *Valdivia*, of 2600 tons, was chartered and fitted up in all respects like the *Challenger*, with a staff of eleven scientific men under Prof. Chun. The Government pays the salaries of these men of science, and insures their lives. The expedition sailed from Hamburg on August 2 last, and proceeded to Granton with Sir John Murray on board, whence they had an opportunity of visiting the *Challenger* Office in Edinburgh, and inspecting the interesting collection deposited there. The *Valdivia* then went round the north of Scotland, and proceeded to the Canary islands, whence the expedition is making its way along the west coast of Africa to the Cape. It will then examine the Agulhas bank, go south to the edge of the antarctic ice, and in a cruise of nine months explore the depths of the Indian Ocean and the Red Sea, returning by the Suez canal. The German expedition is ably directed and admirably equipped, and is sure to yield excellent results, alike creditable to the nation and its government, and to the workers themselves.

In turning our view to the northern regions, we have first to congratulate Dr. Thoroddsen on the completion of his exhaustive Icelandic researches, which have extended over many years. I am glad to be able to announce that he has undertaken to furnish the Society with a complete *resumé* of the results of his labours, and with the materials for a new map of Iceland. The most valuable recent arctic work is comprised in the two handsome volumes recording the results of Dr. Erich von Drygalski's Greenland expedition. Its publication certainly reflects the highest credit on the Berlin Geographical Society. Dr. Drygalski has made a series of very important observations on the inland ice of Greenland, on its movement, on its structure, and on its formation of icebergs, as well as on the biology and botany of the Greenland coast region. I am glad to hear from Dr. Nansen that he is now beginning to print the first parts of the scientific results of his memorable expedition.

Dr. A. G. Nathorst, of Stockholm, has conducted a Swedish scientific expedition to Spitsbergen this summer, on board the Norwegian whaler

Antarctic. He first made a survey and a very thorough examination of Bear island, and also of Bell sound. Dr. Nathorst then penetrated to the east side of Spitsbergen, where he surveyed and mapped Wiche's island. As this island was discovered and named by Captain Edge in 1617, and rediscovered by the English yachtsman Birkbeck in 1864, I am at a loss to understand by what right the name has been changed to King Charles Land, because Von Heuglin sighted it in 1870, and improperly made the alteration. These changes of original names are unjust, confusing, and undesirable from every point of view. The German authorities have attempted to change the names of New Britain and New Ireland, given by their discoverers Captains Dampier and Carteret, early in the last century, to Neu Pommern and Neu Mecklenburg. But I was glad to find, when I visited Berlin this summer, that these unjustifiable changes are not countenanced by sensible Germans, and that "New Britain" and "New Ireland" are still printed in large letters over the cases containing curiosities from those islands in the Berlin Ethnological Museum; neither is the change admitted by our hydrographer, which probably settles the question—our charts being so universally used. Returning to Dr. Nathorst, he passed White island, reached a latitude of 81° 14′ N., and circumnavigated Spitsbergen. The scientific results of his expedition are numerous and valuable, and I am happy to announce that Dr. Nathorst will communicate a paper to the Society, describing those results, in the course of the session. A German expedition under Herr Theodor Lerner, with Captain Rüdiger in command of the vessel, has also been on the east coast of Spitsbergen this summer, and reached a latitude 81° 32′ N.

There are now four expeditions wintering in the arctic regions. The first, in point of time, is the balloon expedition led by M. Andrée, for the safety of which there is now grave reason for anxiety. Dr. Nansen and I believed and hoped that M. Andrée would have reached Mr. Harmsworth's stores in Franz Josef Land, but Mr. Wellman has dispelled that hope. M. Stradling has conducted a search at the mouths of the Lena and Indigirka, and has visited the New Siberia islands, without finding any sign of Andrée and his gallant companions. I still cling to the hope that they may have reached the east coast of Greenland, and may yet be saved.

The three other expeditions, though two of them contemplate useful scientific work, all have the north pole as their chief aim. I have several times repeated that the Council of this Society has always consistently maintained that merely to reach the poles, or to attain a higher latitude than some one else, were objects unworthy of support or encouragement. In our view, the objects of arctic and antarctic exploration are to secure valuable results in all branches of science, and particularly in geographical science. In this view we have the concurrence of Dr. Nansen, and of the late Lieut. Weyprecht, who spoke very strongly

on the subject. Much arctic geographical work remains to be achieved, including the discovery of the northern side of Greenland and its off-lying islands; the examination of the palæocrystic sea from Aldrich's furthest to Prince Patrick island; the discovery of the unknown region between Prince Patrick island and Siberia; and the exploration of Sannikoff Land, as proposed by Baron Toll.

The Wellman expedition to Franz Josef Land has for its avowed object, a struggle to reach the pole, or at least to get beyond Nansen's furthest—"to beat the best record," as they call it. Mr. Wellman has three companions—Messrs. Horlan, Waller, and Hoffman, and he chartered the *Fridtjof*, an excellent little vessel for the ice, to take his party to Franz Josef Land, and put them on shore. He has seventy-five dogs, and his plan is for fifty of the dogs each to drag a small sledge weighing 100 lbs., consisting of a copper tube with runners. Mr. Wellman's party landed last June, and took one of Mr. Harmsworth's houses from Cape Flora to Cape Tegethoff, where they set it up as a base. Mr. Wellman intended to go as far north as he could this season, winter in a stone hut, and again push northwards in the season of 1899. The *Fridtjof* was to return, and take his party back in the autumn of that year.

The two expeditions up Smith sound are of a more serious character, and are likely to do good work, if they succeed in reaching a suitable base for their operations. But the navigation of Smith sound, and of the channels leading northward from it, depends upon the season, and may be impracticable. It is to be hoped, however, that this serious difficulty on the threshold may be overcome.

Lieut. Peary was generously presented with a suitable vessel, the *Windward*, by Mr. Harmsworth, and he left New York on July 2. A vessel called the *Hope* had been sent forward to fill up the *Windward* with supplies, near the entrance of Smith sound. The *Hope* parted with the *Windward* at Port Foulke, to return, on August 12. Lieut. Peary proceeds northwards in the *Windward*, with sixty dogs, five couples of Eskimo, and sixty carcasses of walrus. His intention is to reach and land at Sherard Osborn inlet, send back the *Windward*, and, with the aid of Eskimo and dogs, push onwards to the pole during several years.

The Norwegian expedition, under the command of Captain Sverdrup, has been fitted out at the expense of three patriotic Norwegians, Consul Axel Heiberg, Arnulf and Ellef Ringnes, and the *Fram* has been lent by the Government. The *Fram* has been a good deal altered, and I think improved as a sea-boat. She now has a deck-house, and better accommodation. Captain Sverdrup took provisions for sixteen men for four years, and he is accompanied by a very efficient staff of six scientific men. His plan is also to proceed up Smith sound as far north as possible, to explore the northern side of Greenland, and also, I understand, to make a push for the pole. We cordially wish all possible success to these two

gallant explorers, to the Norwegian Captain Sverdrup, and the American Lieut. Peary.

The exploration of the antarctic regions has now become the most important geographical work of our time. It has been advocated for ten years by the leading scientific societies of this country, especially by the Royal Society, the Royal Geographical Society, and the British Association. It must not cause despondency that so long a time should have elapsed since antarctic exploration was advocated and representations were made to the Government on the subject. It may well take ten years to ensure success, under ordinary circumstances. It took Sherard Osborn and myself over twelve years of hard and constant work before we obtained the despatch of the arctic expedition of 1875. We might not, therefore, be disheartened now if time was of no serious consequence; but there are powerful reasons for urgency, and delay would be a real evil, for other countries do not move at snail's pace.

The antarctic agitation has spread over Europe, and is no longer confined to Great Britain. Indeed, Prof. Neumayer of the Hamburg Naval Observatory has been unceasing in his advocacy for quite as long a time as the scientific societies in this country. The natural consequence has been that more than one small and inadequate undertaking has been set on foot. M. Gerlache, the commander of the Belgian expedition, with very small means when compared with the work to be performed, bought and fitted out a Norwegian vessel, which he named the *Belgica*. She finally sailed from Antwerp, and was last heard of nearly a year ago, when she was in Magellan's strait, on the point of starting for the antarctic regions. The intention of M. Gerlache was to return to Melbourne in April. But she has not since been heard of, and she must have passed the winter of this year in the antarctic ice. She will be the first vessel that ever wintered in the antarctic regions. If there are no tidings of the *Belgica* before next spring, there will be increased cause for anxiety. Sir George Newnes has also purchased a vessel named the *Pollux* at Arendal, in Norway, fitted her out in Norway, appointed Norwegian captain and officers, and given the direction of his expedition to Mr. Borchgrevink, a Norwegian, who gave us some account of his intentions last June. But all this was done without consultation with the Council of our Society, or with any competent authority. Mr. Borchgrevink told us that he intended to proceed to Cape Adare, the nearest point of Victoria Land, make his winter quarters there, and send the vessel back. In the spring and summer of next year he would attempt to make a journey into the interior, and in the autumn the vessel was to call for him and take him and his party on board again. The name of the vessel was changed from the *Pollux* to the *Southern Cross*, and she sailed from London on August 22 last. We wish Mr. Borchgrevink and his companions all possible success.

I venture, however, to think that it would be wiser, and much more

conducive to success, if generous-minded individuals who resolve to make a large outlay on exploring work, would take experts into their confidence, consult the best authorities, and work in concert with the Council of our Society or some other competent body of advisers.

Combined effort should be the motto of those who undertake the work of discovery. The Fellows of this Society have been kept fully informed of the policy of the Council since November, 1893, and of the steps that have been taken to secure the despatch of a Government Antarctic Expedition. This year a permanent Joint Committee for the promotion of antarctic exploration has been formed, consisting of the President and officers and of three Fellows of the Royal Society, and of three Fellows of this Society, including the President. In this arrangement there is the great advantage of combined effort in close connection with the great and illustrious body which is consulted by the Government on all scientific questions. This Royal Society Committee has decided not only to give moral support, but also, if possible, substantial support to the antarctic project; and a recommendation to this effect has been made to the Government Grant Committee. But, on the other hand, the present Government has declined, under existing circumstances, to undertake such an enterprise. My friend and old messmate, Admiral Sir Vesey Hamilton, himself for several years the first Sea Lord of the Admiralty, has conclusively dealt with the objection raised, namely, that naval officers, if employed in the antarctic seas, might be out of reach of the telegraph wire for a few months, or, to use the exact words, "they would necessarily be out of reach for a protracted period, in case of being required for the active duties of the fleet." The admiral has shown that Great Britain's naval supremacy will not be endangered, because a few young lieutenants are employed on detached service. It is true that it is more than likely that there may be changes of policy at the Admiralty, and that the views at present held do not represent a permanent policy of abandonment. Experience has shown that this may be the case. We have had similar refusals before, followed, after an interval, by a return to the wisdom of former days—of the days of John Barrow and of Francis Beaufort. Doubtless it will be so again. But, as regards an Antarctic Expedition, there can be no further delay without deplorable consequences. The question is one of urgency.

The Germans will certainly despatch an antarctic expedition in 1900. Dr. Neumayer, the great authority on terrestrial magnetism, has been working with this end in view for years. Twice he has addressed English audiences on the subject within the last three years, once at the International Congress in 1895, and again at the meeting of the Royal Society last February. He expressed a hope that the work would be carried out simultaneously by expeditions from several countries. Through the continued exertions of Dr. Neumayer and others, promises

of support for an expedition gradually came in. Now, I understand, success has been secured. A steam-vessel, specially designed and equipped for antarctic service, will be built at Bremershaven. The Government, wiser than ours in this respect, will help with funds and in other ways, and will lend officers, even although they may have to go some distance from the end of a telegraph wire. Dr. Erich von Drygalski, the distinguished Greenland explorer, will lead the scientific staff. Dr. Neumayer looks to us for co-operation. The question is, Are we to hold back? Is this country to resign its proud old position in the van of discovery and exploration? Our credit is at stake. You will understand now why we cannot wait for Admiralty changes of mind. It ought to be a Government expedition under naval discipline. But if our navy is to be deprived of its right, the next best thing must be done: we must appeal to the country. This is the reason that the antarctic question is one of urgency.

England owes her commercial greatness to the munificence of her merchant princes. They have ever stepped forward in times of need. The power that wealth supplies has, over and over again, been used for patriotic ends, above all to promote discoveries, and the spirit of maritime enterprise among our people. Let us pass some of these good men and true of olden times in review, and hold them up as examples for posterity. Not to go so far back as to William Canynge of Bristol, who preceded John Cabot in the promotion of distant voyages, we commemorate Master William Sanderson (of the Fishmongers' Company), one of the most enlightened adventurers of his time, to whose munificence is due the discovery of Davis strait. Voyagers who pass up it to enter Baffin's bay, sight the mighty cliff which bears his name, and the instructed among them take off their caps as they pass Hope Sanderson. We commemorate Sir Thomas Smith, the founder of the East India Company, the patron of maritime enterprise, whose name I have had occasion to use more than once this evening, in referring to the famous sound which bears it. We commemorate Sir Thomas Roe, the great ambassador, Sir Dudley Digges, Sir John Wolstenholme, Lancaster, Jones, Wyche, and many more adventurers who, in the days of old, by their aid, fostered the spirit of discovery and maritime enterprise, and thus advanced the prosperity and the glory of their fatherland. All honour to their memories. They are immortalized by capes and bays which bear their names; all except Richard Wyche, director of the East India Company and of the North-West Company, and a great promoter of Spitsbergen exploration, whose island has been improperly filched from him, though the name was given by Captain Edge, the gallant explorer who discovered it in 1617, in memory of his employer's patriotism.

A century elapsed from the days of Byron to the days of Franklin, when the need for private munificence was not felt, in the promotion

of geographical research. It was not felt because our governments then recognized what was the true and best work for the navy in time of peace. Nor did they allow the progress of discovery to be checked in time of war. They did their duty in this respect, and upheld the credit of their country. They kept the British navy in the van of scientific exploration, working for the good, not only of their own country, but of the whole civilized world.

On one occasion during that period, the aid of private munificence was needed, and it was at once forthcoming. In 1829, an eminent distiller, named Felix Booth, equipped an expedition to the arctic regions for Sir John Ross and his nephew. The results were the discovery of the region named Boothia Felix, of the Gulf of Boothia, which long proved to be a remunerative fishing-ground, and of the position of the north magnetic pole. Let it not be supposed that the promoters of such expeditions go without recognition, and that their services are not appreciated by their countrymen and by the Government. On the return of the Rosses, our sailor king, the founder of this Society, promptly created Sir Felix Booth a baronet.

Next after Sir Felix Booth, in the illustrious gallery of patrons of geographical discovery, come the names of Samuel and Charles Enderby. It was under the auspices of my old friend Charles Enderby, who twice served on the Council of this Society, and was one of its original members, that several discoveries were made in the antarctic seas. There must be others living, besides myself, who remember the frequent attendance of old Mr. Enderby at our meetings, until his death in 1877.

Last, but not least, we commemorate the splendid munificence of Mr. Harmsworth, whose efforts have secured a real and solid increase to our knowledge of an important and very interesting portion of the arctic regions.

I cannot, therefore, believe that the patriotic adventurers of the Elizabethan age have no successors; that the race is extinct. I trust that a knowledge of our country's need is all that is wanted. Let it, therefore, be clearly understood that if we are unable to do our bounden duty, and to take our place by the side of the German antarctic explorers, if we are obliged to hold back, our credit as a nation is gone. We must, for the first time in our history, disgracefully take a back place. Worst of all, it will not be from poverty of means, but from poverty of patriotic feeling amongst those who possess the means. But we cannot believe this, and we therefore confidently make an appeal for funds to equip an Antarctic Expedition.

Whatever be the fate of that appeal, the duty of our Council was plain and clear. It was to put the facts, and what was involved by them, before the Fellows of the Society and before the country. This has been done by the publication of the pamphlet which you have all received. Further, the Council has instructed me to make this appeal.

Still further, the Council has resolved to head the list of subscriptions, even if its name should stand alone. There are numerous calls upon our funds, but we have resolved to strain them to the uttermost for this great national work. The Council will head the list with the sum of £5000.

I trust that my voice will not be the only one to be raised in support of the credit and honour of our country this evening. I therefore invite others to bear their testimony, and to discuss the means of raising a fund for the equipment of an Antarctic Expedition.

Prof. MICHAEL FOSTER, Secretary of the Royal Society: Let me, first of all, express the very great regret of the President of the Royal Society, Lord Lister, that, owing to an enforced absence from London, he is unable, as he would have wished, to be present on this occasion. In his absence my brother secretary, Prof. Rücker, and myself are present this evening in order that, while enjoying the pleasure of listening to your President's address, we might at the same time bear witness to the great sympathy which is felt by the Royal Society, not by the Council of the Royal Society alone, but by the whole body of Fellows, with the proposed Antarctic Expedition. There are many reasons why the Royal Society should feel sympathy with such an undertaking. We were founded to advance natural knowledge, and we feel, as it were, hurt when we know that there is any bit of natural knowledge which could be gained, but which is not being gained, for reasons other than the want of intellect to pierce the secret. Then we have from time immemorial been associated with that part of knowledge which is gained by dangerous exploration; nearly all the great explorers have been connected with our Society, and to-night I feel a special pleasure in seeing here one whose name on the one hand is essentially connected with antarctic exploration, and on the other hand is a man of whom the Royal Society is proud as having filled the high office of President to the great satisfaction of all the Fellows for many years; you know him—I mean Joseph Dalton Hooker. Lastly, we have sympathy with this undertaking because there is hardly any part of natural knowledge which will not be the richer for such an expedition. It was, Mr. President, I think, very remarkable, at a meeting which was held at the Royal Society to discuss the scientific gains which might accrue from the antarctic expedition, to note how representatives of one science after another rose and explained what they thought might be gained by the expedition. I think one trumpet gave a rather uncertain sound, and I regret to say that trumpet was blown by a Fellow of your Society. It was most interesting to observe how a younger man at once rose up, and stated that the one gain which would come from such exploration would be that which was rather minimized by the older speaker.

We sympathize absolutely and entirely with this great scientific expedition to explore the antarctic regions, but the Royal Society, though it is supposed to be a society of wise men, is also a society of poor men, or at all events a poor society of wise men. We have hardly money enough to carry on our own work. It would be absolutely impossible for us, much as we should wish to do so, to speak of giving £5000, but we have a hold upon money that does not belong to us. The Government grants the enormous sum of £4000 yearly to use for the cultivation of all branches of science; the committee, to which your President has referred, at a recent meeting, determined to make a definite application to the committee which, under the Royal Society or with the Royal Society, administers this £4000, decided to make a definite application for a sum the giving of which should indicate how

that committee, which is representative, not only of the Royal Society, but of all the scientific societies of this country, held in scientific esteem the proposed expedition. It is not so much the sum of money which may be obtained that is important, but the clear indication thereby afforded that this antarctic expedition is an expedition of undoubted and great scientific value. I do trust, speaking on behalf of the Society, that the appeal which has just been made by your President, may find the money in some pocket or other, for last Whitsuntide my brother secretary and myself, with two other Fellows of the Society, took part in a meeting of associated academies and learned societies at Göttingen, and there, I think I may say, and my brother secretary will agree with me, we felt sorry for ourselves. Our German brethren explained to us what they were doing in order to bring about a German expedition to the antarctic regions; they told us what they were doing, how undoubtedly it would receive the support of the Government, and how they felt perfectly sure that in 1900 they would start; and then they said, "What are you doing in England?" and we were obliged to tell them that we believed an appeal had been made to the Government, and we had reason to think that that appeal would be in vain. But it would be a great thing if it could be shown once more, as it has been shown on many occasions before, that in England the Government is not everything—that Englishmen now, as of old, can do with their private hands what the Government is not bold enough to do, and I think I may say, on behalf of the Royal Society, that if we had money we would give it, but not having money, we join the wish of your President, that some one else may give it.

Professor Rücker, Secretary of the Royal Society: My colleague has laid before you the views of the Royal Society so excellently that he has left little for me to say. One of the reasons why we both wished to come here was, that we wanted to do what in us lay to impress upon any one interested in this matter, that it is one on which the scientific world is unanimous. There are occasions on which the different branches of science seem to a certain extent to compete with one another, either for the loaves and fishes, which both cannot enjoy, or to attain one of two objects, each of which appeals specially to those interested in some one branch of science; but on this occasion the physicists and the biologists stand side by side, for both one and the other know that there are matters of the greatest scientific importance, which can be solved, and solved only, by an antarctic expedition; and therefore we were anxious to impress upon you all—though I believe that very little requires to be done in this hall—the importance of the matter, and the fact that the Royal Society as a whole is anxious that the work should be carried out. It has been my good fortune to have spoken more than once in this hall on the question we are now discussing, and I have laid before you what are the objects to be gained in the cause of the science of magnetism. I will not repeat what I have stated before. But in addition to the meeting to which my colleague has referred, held at Göttingen, I have this summer attended a meeting composed of magneticians only. During the meeting of the British Association at Bristol I was President of the magnetic conference, and one remark made there, which bears on the question, was, that at present the mathematical theory of terrestrial magnetism, the machinery of the mathematical methods, is far ahead of the accuracy of the observations themselves. I don't mean by that that observations carried out by first-rate observatories lack accuracy, but I mean that the observatories are crowded into the better-known parts of the world. The two things wanted to enable us to obtain a fuller, clearer picture of the magnetic state of the Earth are, the establishment of more observatories, especially in the tropics, and perhaps still more important than this, a survey of the antarctic regions. It is for these two things that magnetic science has been waiting. We are ready with our

mathematical machinery, if only investigation will give us the facts upon which the structure of theory may thereafter be built. I cannot, therefore, but hope that this great expedition will be carried out, for I can only concur with Prof. Foster, when he said it was with feelings of deepest depression that Englishmen, who are accustomed to consider themselves leaders in such matters, should see this German expedition planned and preparations made for carrying it out, while we lag behind; it is, indeed, particularly distasteful to the patriotism of English scientific men. I don't think, therefore, that, in putting this matter before you, too much stress can be laid on the fact that it is of the greatest importance that the observations of the two expeditions should be taken concurrently, as they would then be of far more value than the observations of two expeditions taken several years apart from one another. The two expeditions should co-operate one with the other, in the sense that the observations should be carried out with one common object and in regions which had been arranged between the two.

I therefore hope that some one may come forward to help us in this matter, and this great expedition may be sent out. The Royal Society has done, and will do, all that it can in making an application to the Government Grant Committee; although our regulations do not enable us to state what the result of this may be, our great endeavour will be to get a substantial sum, to prove that our interest is not merely platonic. I trust that on this occasion, when all scientific men are unanimous in support of this object—when, indeed, all civilized countries are unanimous as to its importance, that England will be found not lagging in the rear, but once more taking its place in the van.

The PRESIDENT: I rejoice to see present here this evening one we all venerate, although I scarcely hoped to have seen him, and it only shows the deep interest he takes in the subject before us. I allude to our late Vice-President Sir Joseph Hooker, who is the sole survivor of the famous antarctic expedition of Sir James Ross. I trust that Sir Joseph Hooker will kindly address a few words of encouragement to us.

Sir JOSEPH HOOKER: It is, perhaps, only natural that I should look back before I look forward, and I cannot help being reminded of the old proverb regarding hope deferred making the heart of man sick. I will confess to you, sir, that your previous gallant attempts to galvanize an antarctic expedition into existence gave me boundless hopes, only to be disappointed; but, at the same time, let me assure you that every new effort you made was met by a rebound of hope on my part, and on no occasion more than on the present occasion, because I consider that the way you propose to go to work is the most promising as yet made. We must depend upon our own resources, with the national will and the national effort, and I feel sure these will be accorded. If I understand your project rightly, it is to cut our coat according to our cloth, therefore the size of the expedition must depend upon the support we can receive; but I do venture to hope that, whatever it may be, we should commence as soon as sufficient funds are raised for the purpose, whether with a single small vessel, or with a couple of ships of the character of the *Challenger*. Between those there is plenty of room to choose, and our choice must be guided by what we can afford. Now, I foresee that the success of the expedition will depend not so much upon the size of the force we can send, as upon the nature and character of the men we send with it. That a single, even small, vessel, seizing its opportunity, may obtain most important geographical results is evidenced by Weddell's having, in a mere cutter, reached open water in the 75th parallel, and this in a longitude where, twenty years afterwards, Ross, in two well-found ships, spent weeks in the vain attempt to reach the 72nd. It remains to express my earnest hope that Englishmen, all the world over, will liberally

respond to our President's appeal. In respect of the colonies, it has always appeared to me that the apathy shown by Australia and New Zealand especially, to former efforts to obtain their substantial support, was in a great measure due to the representations made to them from this country not having been efficiently delivered and vigorously followed up; and I would suggest for consideration the expediency of making a further effort by applying, not only to the Governments of these colonies and those of South Africa, but simultaneously to their leading scientific societies and influential residents, and their daily papers. It might at the same time be pointed out that there are many ways in which efficient aid could be appropriately offered, and gladly accepted, such as refitting, victualling, and perhaps even financing the expedition, when wintering in their harbours. Such aid as this, I feel sure, need only to be indicated to ensure their being offered.

Admiral Sir Erasmus Ommanney: I congratulate Sir Clements Markham on the admirable address he has given us this evening on the present state of geographical science and of geographical discovery. I wish to express my great pleasure at being here, because Sir Clements Markham was a youngster under me in 1851. I have had a great many pass under my hands, but none that have risen to such eminence as Sir Clements Markham. I have taken some interest in antarctic exploration, partly from the circumstance that I was shipmate with Sir James Ross and Captain Crozier in the year 1836, on a very perilous expedition to the arctic regions in the depth of winter. I believe there is nothing in naval records which has been so glorious as that expedition of James Ross to the antarctic regions. In looking up the memoirs of that expedition to-day, I see that the most eminent philosophers of the time urged the country to undertake the expedition. I have no doubt, when this address is circulated, it will rouse the same interest in philosophical men to support the object we have in view. It is sixty-two years since that expedition went out. Great advantages will be gained by sending forward an expedition now, especially as the naval officers of the present day are men of the highest scientific attainments, and anything sent forth by the Admiralty will redound to the credit of the country. I shall do my best, as I have done at all times, to support this movement. I think it is well to know what the general feeling is on the subject. I took the initiative some years ago, in 1885, in bringing the subject before the public; some years after that I acted as secretary of the committee of the British Association in promoting this object, and I was in communication with the Geographical Society of Victoria, and had thus the means of ascertaining the feeling of our colonies in Australia and New Zealand. Their approval was unanimous, but the only colony which gave any tangible proof was Victoria, which voted £5000, on condition that this country voted another £5000. This was submitted to the Government, and they submitted it to the Royal Society, who decided that £10,000 was not enough for such an expedition. Another time Sir John Elder said he would give £5000 on condition that enough money was collected, but it was not obtained. I believe that the result of this meeting will meet with the approval of the whole world, and I hope that I may live to see the expedition set forth.

Admiral Sir Leopold M'Clintock: With regard to the exploration of the antarctic regions, I do not propose to add a word, or as to the undoubted value of such an enterprise. I will only speak a few words about the Admiralty and naval officers. I think our President is now looking to scientific men throughout the country for that support which the Admiralty and Government have declined to give just at present. In times of profound peace, the Admiralty and the country have, I think, heartily supported these expeditions; but now there are some ugly clouds floating in the political atmosphere which keep the Admiralty at the present

time very busy; and also we must bear in mind, in regard to naval officers, that they are not unlike other men, and that man is a fighting animal, and if there is a chance of a fight, you won't get naval officers to devote their attention to matters of abstruse scientific interest. I do hope that a little time will bring the Admiralty round, and that with changed circumstances we shall have a Government expedition, and, if so, we shall take a great geographical spring forwards.

Admiral Sir WILLIAM WHARTON: The President puts me in a difficult position, because he has devoted a part of his remarks to-night to, we will say, animadverting a little on the conduct of the Admiralty and the Government in declining to entertain the proposition to send out a Government expedition to the Antarctic. I think that a little bit too much has been put upon the Admiralty; but, however, I am not here to defend the Admiralty; although I am an Admiralty officer, I have my own opinions on the subject, and I think I am quite entitled to express them here without in any way committing the Admiralty to them. I should like to say, with regard to an expedition of this kind, that the Government has to consider that any expedition sent out must be a very complete one; and there is no doubt that it will cost a great deal of money. That is nothing really to this country, but still you have to persuade the keepers of the public purse that that large sum of money is necessary, and that is a little difficult, as this is a matter of pure science. We don't think so; we think the scientific results are worth anything, and there is no doubt that such an expedition would be an immensely popular one in the navy. There would be crowds of officers asking to be sent on such an expedition, and I believe it would be better carried out under the auspices of the Government, because it is one of great difficulty, and you want strict discipline; but the Government have, for the time being at any rate, declined to offer their aid, and I am very much of opinion that if a small expedition be sent out by private aid, it will be able to do a great deal, proving the forerunner of a larger expedition afterwards. We have often seen that private enterprise gives the start and moves the country. This could be carried out for a very much smaller sum of money than would be necessary for a Government expedition, as long as they don't start out with the idea of doing as much work as a Government expedition would do, and I am very much in hope that Sir Clements Markham's appeal will end in that aid being given us.

The PRESIDENT: I hope that the meeting is as well pleased as I am with the result of the discussion which has followed my address. We have heard from the secretaries of the Royal Society what a deep interest that great institution feels in the success of our efforts. We have been encouraged in a way that we scarcely hoped for by one who knows the dangers of antarctic service, Sir Joseph Hooker. We have been reminded of all the work done from the beginning by Sir Erasmus Ommanney; we have been encouraged also by Sir Leopold M'Clintock, and above all by the hydrographer. I can bear witness to what he said about the desire of the navy for any work of that description. I remember very well when Leigh Smith was lost, I wrote to Captain Bedford at Greenwich, to see if any naval officers were inclined to go out to help in the search, and when I went down there, there was such a crowd in his office and all round it that I could hardly get near —in fact, all Greenwich seemed to have volunteered. I have had letters from all parts of the world showing the same feeling in the naval service, and I say it is a reason for regret that the navy is deprived of the work that belongs to it; but if it is so deprived, we must use every effort to raise a fund to enable us to take the place of the navy. I do trust that the address, and the discussion which has followed, will be of some service to the cause we have at heart. I have nothing more to add but the expression of my belief that this great meeting is with us.

A DESCRIPTION OF CHRISTMAS ISLAND (INDIAN OCEAN).*

By CHAS. W. ANDREWS, B.Sc., F.G.S., Assistant in the British Museum (Natural History).

One of the most interesting of the lonely islets of the Indian Ocean is Christmas Island, which lies about 190 miles south of Java, in S. lat. 10° 25′, E. long. 105° 42′. The seas around it are of enormous depth, and soundings of over 1000 fathoms occur within 2 or 3 miles of its coasts. To the north and north-west is Maclear Deep, in which 3200 fathoms were found, and to the south is the more extensive Wharton Deep, with upwards of 3000 fathoms. The island, in fact, rises from the summit of the low submarine ridge which separates these two abysses, and on the westward end of which the Keeling-Cocos Islands are situated.

The first mention of the island occurs in a map by Pieter Goos, published in Holland in 1666, in which it is called Moni. In subsequent maps, this name and that of Christmas Island are applied to it indifferently, but it is not known by whom the island was discovered and named. The earliest approach to a descriptive account is found in Dampier's 'Voyages,' † in the following passage:—

"After leaving New Holland, the ship tried to make Cocos, but was driven to a more easterly course, and met nothing of remark till the twenty-eighth day. Then we fell in with a small woody island in lat. 10° 20′. Its longitude from New Holland, from whence we came, was, by my account, 12° 16′ W. It was deep water about the island, and there was no anchoring; but we sent two canoes ashore, one of them with the carpenters, to cut a tree to make another pump; the other canoe went to search for fresh water, and found a fine small brook near the south-west point of the island, but there the sea fell on the shore so high that they could not get it off. At noon both the canoes returned on board, and the carpenters brought aboard a good tree; the other canoe brought aboard as many boobies and man-of-war birds as sufficed all the ship's company when they were boiled. They got also a sort of land animal, somewhat resembling a large crawfish without its great claws. The island is a good height, with steep cliffs against the south and south-west, and a sandy bay on the north side, but with very deep water steep to the shore."

The date of Dampier's visit was March, 1688. The next account of the island is given by Captain Daniel Beekman ‡ in 1718. He remarks that "the island looks exceeding pleasant, being covered with lofty trees, and may be known by the following directions: Coming from the north-westward, it appears pretty high, with a saddle in the middle;

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* Paper read at the Royal Geographical Society, November 28, 1898. Map and Sections, p. 104.

† 'Dampier's Voyages,' vol. i. p. 472. Ed. 1829, London.

‡ 'A Voyage to and from the Island of Borneo, in the East Indies,' etc. London, 1718.

the westernmost land is the highest, trenching away to the northward to a low flat point; the easternmost point is low, but bluff. I sounded within 8 miles of the low point, but had no bottom with the 100-fathom line out. The island is about 7 leagues from east to west."

This writer gives a remarkable sketch, in which the heights are ridiculously exaggerated, the hill over the north-western point being made to look like a high mountain with three peaks; his estimate of the length of the island also is much in excess of the truth.

In 1771, the *Pigot*, East Indiaman, attempted to find an anchorage, but failed. The crews of this and other passing vessels reported the occurrence of wild pigs, coconut palms, and lime-trees, none of which really existed.

The first attempt at an exploration of the island was made by the frigate *Amethyst* in 1857, from which a boat's crew was landed with the object of attempting to reach the summit, but the inland cliffs proved an insuperable obstacle, and the ascent was abandoned.

In 1887, the surveying vessel *Flying Fish* (Captain Maclear) was ordered to make an examination of the island. The coast was found to consist of steep limestone cliffs, and it was only after sailing nearly all round the island that an anchorage was found in a bay with a white shingle beach on the north coast; to this the name Flying Fish Cove was given, and it is now the site of a small settlement. Another white beach was seen towards the north-west point, but no anchorage was found near it. A number of men were landed, and some collections of the plants and animals were obtained, but, since the island seemed of little value, no serious attempt at exploration was made.

In the following year H.M.S. *Egeria* (Captain Pelham Aldrich) called at the island, and remained about ten days. Captain Aldrich and his men cut a way to the top of the island, and sent home a number of rock specimens obtained on the way, and Mr. J. J. Lister, who accompanied the expedition as naturalist, made extensive collections both of the fauna and flora, but had not time to penetrate to the middle of the island.

In 1890 H.M.S. *Redpole* called at the island for a few hours, and Mr. H. N. Ridley, of the Singapore Botanical Gardens, who was on board, collected a number of plants not previously recorded, and has written an interesting account of his visit.*

Although Messrs. Lister and Ridley had made valuable collections of the flora and fauna of the island, the shortness of the time at their disposal rendered it impossible for them to penetrate far into the interior, or to make any examination of the geological structure. Nevertheless, the rock specimens brought back by the *Egeria* showed that the island probably consisted mainly of coral and foraminiferal limestones, resting on a basis of volcanic rocks; and a very interesting

* *Journal*, Straits Branch of the Royal Asiatic Society, June, 1891, p. 123.

paper,* in which the results of the expedition were summarized and the probable structure of the island discussed, was published by Rear-Admiral Sir W. J. L. Wharton in the *Proceedings* of this Society for 1888.

It seemed desirable, however, that a more complete examination of the island should be undertaken, and, if possible, collections should be made at different seasons of the year, and in 1896 Sir John Murray generously offered to pay the expenses of such an expedition. I was fortunate enough to be able to avail myself of this opportunity, and, the Trustees of the British Museum having granted the necessary leave of absence, I left England at the beginning of May, 1897.

FLYING FISH COVE—REEF AT LOW WATER.

At that time the only means of access to the island was by the small sailing-vessels belonging to Mr. G. Clunies-Ross of Cocos-Keeling Islands, which are employed in carrying various supplies from Batavia to those islands, and on their way down usually touch at Christmas Island to land stores for the little colony established in Flying Fish Cove. Unfortunately, one of these vessels had left shortly before I arrived in Java, and I therefore had to wait some weeks before an opportunity of getting to the islands occurred; but at length, on July 23, I sailed from Batavia in the *J. G. Clunies-Ross*, a yawl of about

* To this paper I am indebted for much of the information as to the early history of the island given above.

46 tons burden. After a rather rough passage of five days, we sighted the island from the south-west, having run past it in the night. We arrived off Flying Fish Cove soon after sunset, but did not anchor till the following morning (July 29).

Seen from the south-west, the island appears as a long green ridge nearly level at the top, there being only slight elevations at the north-west and south-east ends. The ridge descends seaward in a succession of terraces, the upper ones bounded by comparatively gentle slopes, the lower by a high and nearly vertical cliff, below which there is a narrow platform sloping gently down to the sea-cliff. This is usually about 15 to 30 feet high, and is much undercut by the heavy swell that is continually breaking against its base. On approaching nearer, it can be seen that the whole island is covered with a dense forest, only broken by the grey face of the high inland cliff which runs round the greater part of the island, rising like a wall above the tall trees growing on the shore terrace.

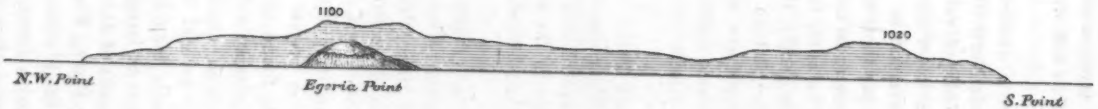
If the coast be examined in a boat or from the top of the sea-cliff, it will be seen that a submarine terrace in the shape of a fringing reef is being formed round the greater part of the island. It varies greatly in width, and also in its depth below the surface; in some places it is partly dry at low water, in others some fathoms deep. Outside the edge of this reef, the water deepens suddenly.

The greatest length of the island, from North-East Point to Egeria Point, is about 12 miles. The greatest width from north to south is about 9 miles; the least 3½ miles. Its area may be roughly stated as 43 square miles.

The outlines of the land, as seen from the south-west, east, and north, and sections* across it at various points are shown in the diagrams. From these it can be gathered that it consists of a central plateau, highest toward the north and east, and descending to the sea on all sides by a succession of terraces separated by slopes or cliffs. In most places the arrangement of these, from the edge of the plateau downwards, is (1) a steep slope strewn with blocks; (2) a broad terrace, followed by a similar slope (this seems to be wanting on the south); (3) a second terrace, terminating in a cliff 200 or 300 feet high; (4) the shore terrace sloping gently down to the sea-cliff; (5) the present fringing reef. There are, however, many local differences, the more important of which will be noticed below.

The Central Plateau.—The edge of the central plateau is roughly parallel to the coast, receding farthest from it opposite the principal headlands. It is highest along its northern and eastern borders, where there is a raised rim, the average height of which above the sea is

* The sections across the western and north-eastern parts of the island are mainly founded on a survey of roads made by Mr. G. Ross in 1897.



From South West.

From North.

From East.

CHRISTMAS ISLAND

about 800 feet. Towards the south it slopes away so that its edge is only from 400 to 450 feet high, but there are some slight elevations above this general level. On the west the upper terraces are replaced by a gentle slope, and even the first inland cliff is not well marked except towards North-West and Egeria Points.

Along the raised rim of the plateau there are a number of hills, the highest of which (Murray Hill) occurs towards North-West Point. It is a nearly flat-topped hill, divided by an oblique valley into a larger and rather higher western portion, and a lower eastern one; the greatest height is about 1170 feet. The summit is formed by masses of dolomitic limestone, and on its lower slopes there are beds of shelly limestone, and a peculiar deposit which seems to be mainly made up of tiny spherules of altered volcanic glass. The outer face is very steep, but toward the south the land first descends gently, then rises a little, finally sinking to the general level of the plateau in a long gradual slope. On the south-western side there are occasionally patches of rounded pebbles, which are of a volcanic nature, and are, perhaps, derived from the bed above mentioned. Similar nodules occur in many places on the higher parts of the island.

The next highest hill (Ross Hill) is over South Point. It also has a flat top covered with dolomitic limestone, in which traces of gastropod shells are visible. On its outer side there is a low cliff, and below this a long steep slope covered with blocks of limestone in the wildest confusion, and thickly overgrown with creepers and brushwood. Towards the plateau also the descent is rather abrupt.

Over North-East Point is another elevation (Phosphate Hill), which, though not so high (900 feet), is particularly interesting on account of the extensive deposit of phosphate of lime which is found there. This substance is strewn over the surface in blocks of all sizes, and in some places it is found to a considerable depth; in others, however, it can be seen to rest directly on an irregular surface of dolomitic limestone, occasional pinnacles of which project through it. At the northern end of the hill the phosphate is found on both outer and inner slopes, but farther south on the plateau side only, the outer being occupied by a reef of limestone, which descends to the terrace beneath in a low cliff. The area actually covered by this thick deposit of phosphate of lime is about half a mile long by a quarter broad, but an immense quantity occurs in the form of irregular nodules and blocks scattered over all the slopes and terraces of this part of the island. There are other less extensive beds over Flying Fish Cove, and also at several points along the eastern edge of the plateau. Probably, when the islands were still low and not covered with forest, they formed the homes of myriads of sea-birds, and the guano thus formed, after undergoing alteration mainly through loss of its organic matter, gave rise to the hard phosphatic rock now existing. At the same time the

limestones on which it rests have often been phosphatized, and lumps of coral consisting mainly of phosphate of lime are sometimes found. The extensive accumulations of guano which must have taken place point to a time when the rainfall was much less than at the present day, a condition which may, at least in part, have been dependent on the circumstances that the islands were low and probably free from forest.

On the eastern rim, between Phosphate Hill and Ross Hill, there are several smaller elevations, all presenting similar characters, viz. having on their seaward side a steep talus slope or low cliff, a flat top, and a moderate declivity on the inland side. Between the hills both on the north and east coasts, the rim of the plateau varies a good deal in character. As a rule, its outer edge is marked by a kind of rampart of

NORTH COAST, LOOKING NORTH-EAST TOWARDS SMITH POINT.

lines of limestone pinnacles separated by channels, but sometimes it descends by a gentle slope; in either case beneath the cliff or the slope there is always a steep talus-strewn declivity passing down to the first terrace.

The northern part of the plateau within the elevated rim is particularly characterized by the presence of numerous low hills (about 50 feet), with more or less flat tops covered with blocks and pinnacles of limestone. Further south there are several step-like ridges, running in an approximately east-and-west direction; their southern face is covered with blocks of limestone, composed mainly of rather fresh-looking corals. In a few places similar limestones form extensive reefs, cut up into deep channels and holes. These reefs, when covered with thick bush, form almost impenetrable obstacles.

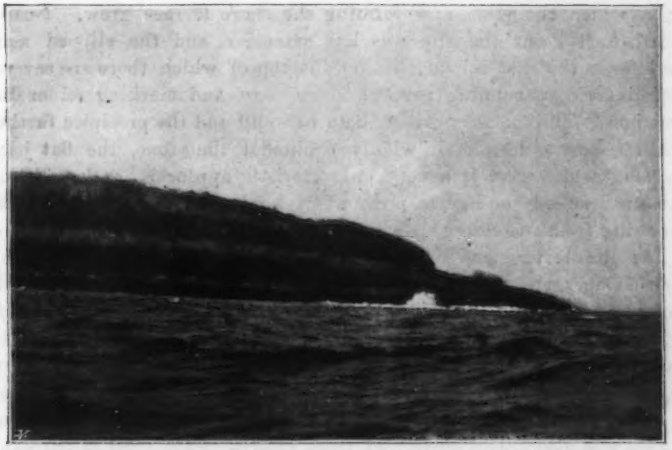
The Upper Slopes and Terraces.—As already mentioned, there is beneath the edge of the plateau a steep slope usually covered with talus; where the rocks composing it are exposed they are found to consist of foraminiferal and coral limestones, and are often full of angular fragments of older limestones. Beneath this slope is a level terrace varying in width from a few yards to a quarter of a mile or more, and bounded on the seaward side by a second steep declivity, or in places by an actual cliff. The rocks composing this usually show very distinct traces of coral, and sometimes seem to be entirely composed of it. This slope is absent on the southern side of the island.

The next terrace also varies considerably in width; on its outer margin there is usually a broad belt of limestone pinnacles, separated by channels. In the neighbourhood of Steep Point, it rises into a rounded hill covered with blocks of phosphate of lime. This hill must have formed a small islet at the time the foot of the second inland cliff was washed by the sea. In other places there is a channel 40 or 50 yards wide running parallel to the edge of the cliff; the inner side is formed by a cliff 30 or 40 feet high, the outer by walls and pinnacles separated by branching channels, the floor of which, like that of the main channel, is perfectly level. Towards the sea there is a steep slope covered with blocks of limestone. When the sea was from 350 to 400 feet higher than at present, this channel formed a sort of canal in the reef parallel to the coast.

Beneath the terrace just described comes the first inland cliff, by far the most conspicuous feature of the island. Usually it has a vertical, or nearly vertical, face, and it is especially well marked at the headlands. Its summit is from 250 to 300 feet above the sea. In several places about 150 feet above the shore platform there are distinct traces of wave action, the most notable being the presence of caves along this line. In some cases beneath this point, instead of a vertical face, we find a steep slope of limestone with coral in position of growth, apparently the remains of a narrow fringing reef, founded upon and partly composed of talus. The fact that the elevation of this cliff has been of an intermittent character is further shown by the fact that where the slopes of the island are gentle and no high cliff has been formed, there is either a succession of minor cliffs separated by terraces and partly built up of coral rock, or merely a slope with ledges of coral limestone. Although these minor cliffs and ledges may be continuous for some distance in any given locality, they do not always correspond to those found a few miles off. It must also be noted that the geological structure and even the origin of this cliff is not everywhere the same, a point that will be referred to more fully below.

The shore terrace slopes gently down from the foot of the first inland cliff to the sea-cliff, which is from 15 to 30 or more feet high, and is often undercut by the waves to a remarkable extent, so that it sometimes

overhangs more than 20 feet. The inland side of this terrace is usually covered with pinnacles of rock similar to that forming the cliff above, and formed part of the fore-shore planed down by the waves. Near the sea the terrace is clearly a raised fringing reef resting on a foundation of talus; the corals are often very fresh in appearance. In some localities this platform has been cut into the older rocks (orbitoidal limestones, basalts, etc.) which form the basis of the island, and in such places small streams may occur, the water being held up by the volcanic rocks. The point where these are best developed is on the east coast, where there are two or three muddy brooks and a small fall of excellent water, which gushes out over a bed of basalt just above high-water mark.



NORTH-WEST POINT.

On the south, where the cliffs are exposed to the full force of the swell produced by the south-east trade wind, which blows most of the year, the coast scenery is very fine. The cliffs are cut into numberless narrow inlets, and their summits are often completely bare of vegetation for some distance from the sea. Blow-holes are very numerous, and several columns of spray rising high above the trees may often be seen at once.

At various points round the coast there are shingle beaches. The most important of these are those in Flying Fish Cove and West White Beach (see map), at both of which landing is fairly easy. There are also two or three others on the north coast, several on the east, and one or two towards the northern part of the west coast; most of these are small, and are shut in by cliffs, and covered at high water.

The above is a brief account of the usual plan of the island, but there are several localities in which considerable divergences from this occur. One of these is Steep Point, where a deep fissure, forming a narrow valley, has cut off an angle of the first inland cliff, and the portion thus isolated has tilted forward so that the usual shore platform, if it ever existed, has been carried beneath the sea, and the headland, which is 150 to 200 feet high, is, in fact, part of the first inland cliff.

Again, on the east coast, near North-East Point, extensive slips or faults have taken place, the result being that the ordinary terraces are replaced by a single precipice 500 to 600 feet high, the foot of which is covered by talus of enormous blocks of limestone. In this case the edge of the island as far back as the second inland cliff has slipped down beneath the sea, and has helped to build up the foundation upon which the reefs now forming the shore terrace grew. Nearer North-East Point the slip was less extensive, and the slipped mass here forms the first inland cliff, on the top of which there are several step-like ridges running parallel to its edge, and marking minor dislocations. The rock comprising both this cliff and the precipice further south seems to be almost wholly orbitoidal limestone, the flat joint faces of which give it a very characteristic appearance; the cliff on the southern side of Egeria promontory is similar, and the small cliffs resulting from successive slips can be seen in the photograph.

At the western end of the island the upper cliffs are replaced by gentle slopes, and even the first inland cliff is ill defined, except towards North-West and Egeria Points. Another characteristic feature of this region is the occurrence of several valleys running down to the sea in a generally south-westerly direction. These first commence as a shallow depression at about 400 feet, but as they are followed seawards, deepen to a narrow gorge which cuts through the first inland and sometimes the sea cliff also. The scenery of these valleys is the most picturesque on the island, and reminds one a little of the dales in the mountain limestone in the Peak District. The floor is generally formed of volcanic rock (basalt), and in the wet season is occupied by a small stream, which descends to the sea by a succession of falls and rapids; at the time of my visit water was only found in the northernmost valley.

The last locality to be described is Flying Fish Cove, by far the most important, because it seems to supply the key to the structure of the island as a whole. In the large-scale map of this district, it will be observed that at this point the sea-cliff is interrupted, and its place taken by a long curved stretch of white shingle beach, in front of which a broad fringing reef stretches from one end of the cove to the other. Behind the beach is a nearly level platform, composed mainly of blocks and fragments of coral mingled with talus from the cliff above. This level has been, for the most part, cleared and planted with cocoa-nut palms, fruit-trees, and vegetables, and is the site of "Clunies-Ross

Settlement," which consists of some nine or ten houses, workshops, and stores. The cliff forming the back of the cove is about 500 feet high in the middle, but decreases in height towards the ends, and towards the north the slope becomes less steep. For the greater part of its length it consists of alternations of low, more or less vertical cliffs, with steep talus slopes; but towards the southern end, the upper part forms overhanging precipices 200 feet or more in height, while the lower portion is covered by a talus slope of limestone blocks, often as large as a fair-sized cottage. Some of these lie far out on the reef. In this cliff and in its immediate neighbourhood we have almost the only section from which it is possible to get an idea of the nature of the foundation upon which

STEEP POINT.

the upper reefs have been established; almost everywhere else the central portion of the island is concealed by the investing covering of more recent limestones which have formed round the island, either as sediment derived from the higher coral masses, or as reefs which have grown on the slopes of the island during its elevation. The circumstance that nearly all the rocks of the island are white limestones, often largely made up of fragments of older beds or containing fossils derived from them, renders the interpretation of the facts observed a matter of great difficulty. It will not be necessary, however, here to enter into details of the geology of the island, and only a brief sketch of the structure of the neighbourhood of Flying Fish Cove is given.

Round the greater part of the cove, about halfway up the cliff, there is a thick bed of yellow foraminiferal limestone, the nearly vertical face of which is from 15 to 60 feet high. Beneath this, and apparently penetrating its lower surface, are several masses of volcanic rock, mainly basaltic. Above the limestone is another bed of basalt, upon which there are thick bands of palagonite tuffs, and occasionally traces of basalt above these again; but the upper slopes are so thickly covered with soil and fallen blocks of limestone, that it is difficult to determine the exact structure of this part of the cliff. About the middle of the cove, the hard limestone is found at a rather higher level, apparently the result of faulting, but its relations to the volcanic series are the same. Southward of this the bed dips downward towards the shore, and the basalt and tuffs resting upon it disappear abruptly, their edges being overlapped by hard white limestone with Orbitoides. This rock forms the upper 50 feet or so of the cliff throughout its northern half, and on the summit occurs in low cliffs, ridges, and pinnacles. At the southern end of the cove it thickens out to a cliff some 250 to 300 feet high, the lower part of which is penetrated by masses of basalt. On the terrace above the cliff to the southward this limestone is found on the eastern and western sides of a broad belt of basalt, which forms a series of rounded hills with valleys opening toward the sea. On the eastern side its base is about 500 feet above the sea; on the west, where it is largely concealed by the more recent deposits forming the cliffs and terraces representing the first inland cliff, it is only 300 to 350 feet. No doubt this limestone once completely covered the basalt, but has been removed by denudation; and, in fact, further south the volcanic rock is completely concealed by limestones.

Further inland, above the orbitoidal limestones comes the steep slope of the second inland cliff, which is here largely composed of corals; shells of mollusca are also found, and there are some beds of foraminiferal limestone without Orbitoides. Above this cliff is a long slope with lines of limestone pinnacles parallel to its edge, and above this again the upper inland cliff or rather slope. Along the foot of this there are some ridges of coral limestone; but towards the summit it rises into rounded hills of dolomitic limestone, with a great many blocks of phosphate of lime here and there. These hills are probably the remains of islets along the edge of the lagoon (now the plateau) before the first elevation of the island took place.

The history of the island, as far as it can be made out, seems to have been as follows: At first, at no great depth, there was a submarine bank upon which numerous foraminifera, including Orbitoides, lived, and the shells of which formed thick beds of limestone. The foundation of this bank was volcanic, and from time to time lava was erupted through and upon the limestones: the occurrence of thick

bands of palagonite tuff indicates that the eruptions were submarine. Some elevation took place, and the beds of tuff became consolidated by the infiltration of lime. In the next place, the whole was covered with thick beds of white limestone crowded with large Orbitoides. These strata seem to have overlapped the edges of the beds of tuff, and in places it can be seen that they dip away from the central mass. The deposits resting on the orbitoidal limestones are for the most part covered with recent accumulations, but they appear to have been mainly foraminiferal limestones.

Upon the foundation thus prepared extensive reefs grew up and

EGERIA POINT.

formed an atoll-shaped group of islands, the reef-flat and islands being now represented by the raised rim of the plateau and the hills rising from it, the lagoon by the central plateau itself. The rounded hills and lofty pinnacles found within the raised margin are probably the remains of knolls and masses of coral growing up in the lagoon, such as may be seen in the Cocos-Keeling Islands at the present day. The height of the hills over North-West and South Points may be accounted for by supposing either that they are points of local elevation greater than that affecting the main mass of the island, or that they represent the higher parts of the bank, upon which reefs were formed before the greater part of it was near enough the surface for the growth of reef-corals. During the formation of these higher reefs, the material

derived from their wear, mingled with the remains of organisms living round the coast, formed thick deposits of limestone round the flanks of the island.

The first important movement which took place seems to have resulted in the elevation of the northern and eastern sides of the island, the south and west probably remaining submerged. At this time the reefs forming the second inland cliff grew round the north and east coast, and probably some of the ridges of coral limestone running across the middle of the island were formed near the new shore-line on the side of the lagoon.

The next extensive elevation affected the whole area equally, and along the new shore-line the second inland cliff was cut back into the reefs just formed, or even in some places into the central foraminiferal limestones. Subsequently a series of movements of elevation led to the formation of the first inland cliff, or, on the more gentle slopes, to the succession of small cliffs and ridges of coral rock which represent it.

During these various movements much slipping and faulting took place round the island; the effects of this at Steep Point and North-East Point have already been described. As a result of this, and of the action of the waves around the coast, a submarine talus slope was formed, upon which a fringing reef was established, and at the next elevation this was converted into the shore terrace, while its margins were cut back into the present sea cliff. Finally, as already mentioned, a reef is now growing round the island which some day may form yet another raised terrace.* It is a point of some interest that Mr. Andrew Ross, during the eight or nine years he has been residing on the island, has noted the occurrence of two slight earthquakes, the most severe occurring in October, 1895; this was followed by heavy falls of rock from the cliffs.

Climate.—The climate of Christmas Island is delightful, and during the greater part of the year resembles a very hot English summer tempered with sea-breezes. The maximum temperature recorded during my stay was 89° Fahr. on November 20; the minimum, 70° Fahr. on February 13, when it was raining heavily. The greatest range of temperature in twenty-four hours was 14°. The average maximum and minimum may be taken as about 84° Fahr. and 75° Fahr. respectively, the former occurring an hour or two after mid-day, the latter shortly before sunrise. The prevailing wind is the south-east trade, which blows about three hundred days in the year. During this

* In the above account of the probable history of the island, I have frequently used the terms "elevation" and "upheaval." It would have been better to have used Suess's expression, "negative movements of the shore-line," as there is no evidence as to what share in the changes in the relative levels of land and sea must be ascribed to actual elevation of the former.

time the sea in Flying Fish Cove is calm, and ships can anchor safely. Between December and May the wind now and then shifts round to the northern quarter for some days at a time, and sometimes blows hard from that direction. At such times the sea along the north coast and in the cove is tremendous, and the valley is filled with spin-drift which wets everything, and rises above the high cliff like smoke. The rain also is very heavy and may continue for a week, but usually the mornings are fine. Occasional heavy showers occur at other times, and in the higher parts of the island are frequent at night. Very heavy dews keep the vegetation fresh even after a long spell of dry weather. The

MOUTH OF SYDNEY'S DALE.

island is perfectly healthy, there being no marshes or stagnant pools, while on the other hand there is a fair supply of good water.

Vegetation.—As already mentioned, the whole island is covered with forest, except the spray-swept edges of the sea-cliff and the vertical faces of the inland ones. Near the sea there is usually a belt of thick low forest of ironwoods (*Cordia*), nyamplons (*Calophyllum*), waroo (*Hibiscus*), etc., mingled with pandanus, which in places forms impenetrable jungles. Outside this the cliff usually has a scanty covering of coarse grass and clumps of bushes (*Pemphis, Scævola*, etc.). Within it, on the other hand, the rich phosphatic soil supports a thick forest of lofty trees. One of the most remarkable of these is a species of

Gyrocarpus, or winged-fruit tree, to give a translation of the native name, the fruits of which have two membranous expansions, something like those of the fruits of the ash, by means of which they are carried long distances; except during the rainy season this tree is completely destitute of leaves, and since it is very common it gives a very peculiar aspect to the forest near the coast. Other notable trees are the Boognor (*Berrya*), the timber of which is extremely good, and has been called teak; the buttress tree (*Eugenia*), round the base of which buttress like outgrowths occur, sometimes 10 feet high by 15 or 20 long, and not more than 2 or 3 inches thick—many of the other trees have buttress-like supports, but in none are they developed to this extent; the stinking-wood tree (*Celtis*), the peculiarity of which is perhaps sufficiently explained by its name; the wild sago palm (*Arenga Listeri*). The last is peculiar to the island, and is valuable on account of the excellent sago that it supplies; in favourable localities it may reach a height of from 60 to 70 feet.

Numerous creepers scramble among the treetops and bind them together, and many ferns, including the large birds'-nest fern (*Asplenium nidus*), grow on their trunks and branches, adding greatly to the beauty and variety of the forest scenery. The orchids are few and small. In the middle of the island, besides the comparatively open forest of large trees, there are patches and belts of extremely thick bush, in which the trees, mostly nettles, are not more than 20 to 30 feet high: the undergrowth consists of pandanus, ferns, and creepers, which together form a matted mass exceedingly difficult to get through at the best, and, if growing on a reef of jagged limestone rocks, quite impassable.

Animal Life.—As must be expected in an oceanic island, the fauna is not a rich one. There are only five species of mammals, consisting of two kinds of rats, a shrew-mouse, and two bats. The presence of the rats and shrew must be accounted for by supposing that they were drifted to the island on floating wood, while the bats reached the island by flight. Owing to the abundance of food and absence of enemies, the rats swarm everywhere. At nightfall they appear in troops, and in the bush, within the circle of light round the camp fire, twenty or thirty could sometimes be counted at once, and their peculiar querulous squeaking could be heard on all sides. They get into the tent at night, and even in the house at Flying Fish Cove I have had them run over me while sleeping. They eat nearly everything that can be eaten, and are particularly destructive to the fruits and vegetables that are now being cultivated. A reddish-brown species is by far the more numerous; it is an expert climber, and I have seen it run up the trailing bush-ropes like a squirrel. The second species is black, with thick coarse fur; it is a comparatively sluggish animal, and lives in burrows in small colonies. Both species are peculiar to the island.

Of the bats, one is a small insectivorous species, the other a large

fruit bat. The latter is very common, and a great nuisance, both on account of the quantities of fruit, especially papaias, that it destroys, and also because of the noise it makes, its cry being a horribly harsh scream, apparently uttered during both the inspiration and expiration of its breath. One remarkable peculiarity is that this bat has to a great extent abandoned nocturnal habits, and several may often be seen circling about high in the air in the bright hot sunlight, sometimes

FOREST ON PLATEAU.

even in the middle of the day. It is found only in the island, and, according to Mr. O. Thomas, its nearest ally is a native of Lombok.

The land-birds, except the birds of passage and a small rail, are all peculiar to the island. They include two kinds of pigeon, a hawk, an owl, a thrush, a species of Zosterops, and a small swift (*Collocalia*). The large fruit pigeon (*Carpophaga*) is very common, and its deep booming note is the most striking sound in the forest in the daytime. The small ground pigeon, with its bright metallic green back, grey head, and chestnut breast, is the most brilliantly coloured of the island birds,

but when running among the fallen leaves, its colours harmonize so well with its surroundings that it is very difficult to see. The owl is chiefly remarkable for its peculiar note, which resembles the short bark of a small dog, usually repeated five or six times, but sometimes continued much longer. At night in the forest, half a dozen of these birds may often be heard barking in answer to one another.

The birds of passage nearly all come in the rainy season, and arrive after north and north-east winds; they include whimbrel, plover, snipe, wagtail, swifts, and some others.

The sea-birds are the most conspicuous of the inhabitants, the island being the breeding-place of thousands of frigate-birds, gannets, boobies, etc. The frigate-birds and gannets build in the high trees near the coast; of the former there are two species, one considerably larger than the other—these nest in different localities. These birds are the most important source of the food-supply of the island. They are usually caught thus: A man, armed with a pole 10 or 12 feet long and a red cloth, climbs a high tree near the coast, and, standing on the top-most branch, waves the red rag. The birds are attracted by this, swoop round to investigate, and are knocked down with the pole; in this way enough to supply food for the few inhabitants can usually be obtained without much difficulty.

The reptiles are few and small. There are five or six species of small lizards and a little blind snake (*Typhlops*), which lives in damp places under logs and rocks.

Insect life is fairly abundant. The number of species of butterflies is small, but some of them are very common. Moths are numerous: one grey-and-black species may be seen in thousands, packed together in solid masses several feet long, on rocks and branches of trees. The number of beetles is not very large, but there are several wood-borers which cause great damage to certain trees. After north or north-east winds swarms of dragon-flies often appear, having most probably been blown across from Java.

There are several species of land-crabs, the most common being a little red crab living in burrows all over the island. The robber-crab (*Birgus latro*) is also very numerous, and if one sits down for a short time anywhere in the forest, numbers can be seen approaching from all sides. They are good climbers, and ascend trees in search of food.

The land mollusca and spiders need not be noticed here. One remarkable circumstance is the occurrence of no less than four species of earthworms, two of which are peculiar to the island; their nearest allies seem to be natives of Sumatra and the Aru Islands. It is difficult to account for the presence of these animals in an oceanic island, since both they and their ova are quickly killed by sea-water.

Inhabitants.—For some years Mr. Andrew Ross, brother of Mr. George Ross, the owner of Keeling-Cocos Islands, has been settled in Flying

Fish Cove with his family and a few men from Cocos. During his stay some substantial houses have been built, wells sunk, and fruit-trees and coconut palms planted, and a small experimental plantation of coffee was also made, and the results leave no doubt that the island is well suited for coffee-growing. Recently a number of coolies have been imported from Java to make the necessary preparations for working the valuable deposits of phosphate of lime. When I left the island in May, 1898, the total population was about forty.

Finally, I must express my deep obligation to Sir John Murray, who rendered my visit to the island possible. My thanks are also due to Messrs. G. and A. Clunies-Ross for their hospitality and assistance while I was on the island; and to their nephew, Hugh Ross, who accompanied me everywhere on my various expeditions, and whose knowledge of bush life was of the greatest value to me.

Before the reading of the paper, the PRESIDENT said: We are going to hear this evening a very interesting account of an isolated island in the Indian ocean, which has remained uninhabited during all the centuries until the last ten years, and therefore has developed its flora and fauna without the interference of man. This of course gives the island a special interest to geographers and to all men of science. Mr. Andrews has been, I believe, several weeks in the island, and has forced his way across it through the forest. We have to thank Sir John Murray for having initiated the plan of exploring this island. I now call upon Mr. Andrews to read his paper.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: Sir William Wharton, who gave so interesting an account of Christmas island a few years ago, very much regrets he is unable to be present this evening. I am also sorry to say my friend, Captain Pelham Aldrich, on whose journal Admiral Wharton's account was based, is also unable to be present; but several scientific men are here, and I am sure the meeting will be very much interested to hear their remarks on Mr. Andrews's paper. I will first call upon Prof. Judd.

Professor JUDD: In listening to the very interesting and fascinating paper which has been given to us to-night by Mr. Andrews, I could not help recalling a conversation which I had with Prof. Huxley shortly before his death. We had been discussing that ever new subject, the origin of coral-reefs, when Huxley observed, "I am convinced, from all that is being done now, that we shall not find any simple, easy explanation of all coral-reefs; that the study of coral-reefs is one of the very greatest complexity; that the conditions under which they were formed must have varied greatly in different cases; and that one theory of their origin will probably not be found to suit all the cases." I think that the experience of the last few years will tend to convince every one of the truth of this observation.

There are, I think, two ways in which the study of coral-reefs may be approached—the first is the method which, by the great liberality of Sir John Murray and the wonderful enterprise of Mr. Andrews, has been so well exemplified in the paper placed before us to-night. This method is to find some example of an undoubted coral-reef, which happens to have been raised above the level of the sea, and then cut into by the action of denudation. In that case we get a coral-reef which has been actually dissected. We can observe all the internal structure of the mass,

and make observations as to the nature of the rocks of which it is built up, the organisms of different kinds which have gone to compose its mass. We may hope, from the study of such an upraised and dissected coral-reef, to learn more than we could by studying a coral-reef the greater part of which is buried and concealed beneath the ocean. Now, I am satisfied that when Mr. Andrews and his colleagues at the British Museum have been able to study the wonderful collection of rocks and specimens of organisms which Mr. Andrews brought from Christmas Island, we shall know a great deal more of the nature and composition of coral-reefs than we know at present. But there is one very great difficulty in a study of this kind which must be obvious to every one—it has appeared, from the observations made to us to-night by Mr. Andrews. He pointed out, and no doubt truly, that the hills forming the top of the island were at one time isolated coral masses forming a ring, in all probability parts of an atoll; but the action which has raised these coral-reefs and opened them out by denudation has to a very great extent obscured their origin, and therefore it will require a very great deal of careful study of the nature of the rocks, and the question as to the depth of the water under which each kind of rock was formed, whether the materials were subaërial or submarine, and questions of that sort will have to be carefully considered before the actual origin of the island can be made perfectly clear. Many of these questions are questions of considerable difficulty. Doubtless, as Mr. Andrews has pointed out, the latter part of the history of Christmas Island is a history of continuous but interrupted elevation; but the question whether the period before that period of elevation was not one of long and constant depression is one that I think is open to all geologists and naturalists to discuss.

But I may, perhaps, remind you on this occasion that there is another way in which coral-reefs may be studied. There are coral-reef atolls about which there is no mistake: they are exposed to the surface of the ocean, and we can study them and examine the organisms which are building them up, measure the depth of water within and around them, and so forth; but the difficulty is that the great mass of the reef is buried beneath the waters of the ocean. Now, it has long been felt that if we can only make a hole deep enough in one of these undoubted atolls or other reefs, we should have the means at our disposal of learning much that is new about such coral-reefs. Long ago Mr. Darwin wished, and wished in vain, for that wonderful millionaire (who exists in America, but is so seldom found on this side of the Atlantic), to put down the necessary sum of money, and we have waited and waited in vain, until men of science have despaired of ever finding him; and so we have been trying to do what we can for ourselves. Some enterprising individuals in New South Wales first started the movement and approached the Royal Society; and the Royal Society approached the Admiralty, with the result that a committee was formed at the Royal Society and in connection with the British Association in this country, to co-operate with a committee in Sydney; they fortunately secured the aid of the Admiralty on this side and the Government of New South Wales on the other side. The New South Wales Government agreed to provide the boring apparatus necessary for the work; the Royal Society have, from the Government grant and other sources, been able to supply a large proportion of the funds; and very energetic workers have volunteered their services to go out and direct the work. It was made a *sine quâ non* by the people in Sydney that if a boring were made it should be made in the Pacific ocean, and not in the Indian or any other ocean. Sir William Wharton, who, I regret, is not present here to-night, and to whose enterprise and sagacity the success that has attended the operations in the Pacific is due—and we have heard what he has done in the Indian ocean—after considering the matter, selected an island in the Ellice group bearing the name of Funafuti, as the

most promising locality for boring operations. First of all, the expedition went out under Prof. Sollas in 1896, making its headquarters in Sydney; then one from Sydney under Prof. David in 1897; and now some of the pupils of Prof. David have gone out again, and I think we may congratulate ourselves upon the success which has attended these expeditions. In the first place, the Admiralty sent out a most experienced navigator in Captain Field; they made such a complete survey of a coral atoll, working out its form and the form of its lagoon by sounding, and the depths of the ocean round it, that we now know the form and character of a great coral-atoll as it has never been known before. Further than this, very important collections have been made by the naturalists I have named, and others, while the work was being carried on at the boring, and I am happy to say that the boring has been entirely successful. We never thought that we should get to more than a depth of 1000 feet, while the latest news is that it had already reached last August within a few feet of that depth from the surface. It was then going on, and we are waiting daily for later news, which I believe will tell us that this depth has been greatly exceeded. Only a portion of the core, that is of the material obtained, has been examined in this country. It will take a long time for the naturalists of the British Museum and elsewhere to thoroughly work out the whole question, but I may point out that already a great deal of work has been done by my colleague, Mr. Cullis, on the chemical and mineralogical characteristics of the rocks, so far as they have reached this country, and the results are of the greatest interest. Dolomite occurs, and there are many points in which the comparison of materials from Funafuti with those from Christmas Island may be expected to throw much new light on the origin of coral-reefs. One of the most interesting facts is that Funafuti and some others are not mainly composed of coral, but botanists may lay almost as much claim as the zoologists to these structures, for the calcareous algæ form as large a part of the reef as the animals we group together under the general name of corals.

Returning to the point from which I set out, nothing can prove more strikingly the difficulties as to the origin of coral-reefs than the comparison of Christmas Island as described so clearly and graphically by Mr. Andrews, and Funafuti as made known by the exploration of those other observers. In Christmas Island we have volcanic rocks coated over with masses of coral, and igneous rocks everywhere interlaminated with limestone; while in Funafuti, which we now know to a depth of 1000 feet from the surface, and of which we have most extraordinary and interesting borings in the centre of the lagoon, there is no volcanic rock whatever, but limestone of wonderful purity, with no foreign materials whatever, and the remains of calcareous skeletons of plants and animals. Here we have two utterly contrasted cases. I will say nothing on the vexed question as to the origin of coral-reefs, but I am prepared to anticipate with the very greatest confidence that the working out of the materials collected by Mr. Andrews in the raised reefs of Christmas Island, similar materials being collected by Dr. A. Agassiz in the Fiji Islands raised reefs, and the comparison of those with the materials obtained in the boring at Funafuti, if they do not settle the vexed question, will teach us for the first time what coral-reefs, and atolls especially, are, and will throw much new light on the important problem of the origin of these most wonderful structures.

Dr. WOODWARD: I think I shall be consulting the feelings of the meeting most by saying as few words as possible. We all must regret the absence of Sir John Murray, because to him we owe the inception of the expedition which has led to this very important paper which has been contributed to the Royal Geographical Society by Mr. Andrews. The work which he has accomplished was concluded in ten months, and is a thing which one may be very proud of, as a specimen of good

results achieved in a short time by a naturalist from the British Museum. I, for one, am very proud indeed to be associated with Mr. Andrews. He has brought home over two thousand specimens, besides a large collection of plants, and, as Prof. Judd has pointed out, has given us most admirable geological information about the structure of coral-reefs. His observations, I think, if properly and carefully worked out, ought to furnish information just as valuable as the deep boring at Funafuti. I believe that Mr. Andrews will be able to show that these successively elevated terraces above the present reef on the margin of Christmas Island are as important a contribution to our knowledge of the structure and origin of coral reefs as a deep boring through a sunken atoll.

The collection of animals has extreme interest for the naturalist, on account of the remarkable fact that this island is nearly 200 miles distant from the nearest land, Java, so that it stands out in mid-ocean, in very deep water, and yet contains as many as five indigenous mammals, several birds, and a very large collection of invertebrata. Among the interesting living invertebrates it is remarkable to find a number of earth-worms, because we know that the transfer of earth-worms to distant points in the middle of the ocean, surrounded by deep water, must be a very exceptional thing, and must have occurred at a very distant period of time. So one may look upon this island as a most ancient geological point on the surface of the Earth; and all the plants and animals that are indigenous must be treasured up as of great scientific importance. The large collection of insects has not even been touched upon, and that we hope will, when worked out, prove quite as interesting as the higher forms of life found on the island. I can only congratulate Mr. Andrews on the interesting paper he has brought before us.

Mr. George Murray said that, having had some small influence in the selection of Mr. Andrews for the exploration of Christmas island, it was a particular satisfaction to him to listen to his account of admirable work—to an account both modest and lucid, as became so thoroughgoing a student of science as Mr. Andrews. With regard to the flora of Christmas island, it had previously been examined by Mr. J. J. Lister and the officers of H.M.S. *Egeria*, who had published in the *Journal of the Linnean Society* for 1890 a record of fifty-five flowering plants and seventeen vascular cryptogams. Mr. H. N. Ridley had landed on the island, and given a brief survey of his observations in the *Journal of the Straits Branch of the Asiatic Society* for 1891. On this material it was possible to reach a provisional opinion that, as in Java there was no distinctly Australian element, while, as Prof. Oliver has mentioned in his report, most of the plants could not be exactly matched with their congeners from Java, but yet varied insufficiently to be specifically distinguished—an indication of considerable age of the island's flora. It was, therefore, a case for the most careful collecting and for the closest scrutiny in working out the collections. Owing to the fact that many of the Malayan type specimens are in Leyden, this will take some time to do with justice, but he ventured to give the results up to now, together with the most modest forecast. About forty species of Polypetalæ have been determined by Mr. Edmund Baker, perhaps representing one-third of the total flowering plants. Among them there are a few entirely new and other interesting forms, while the cryptogams will probably yield a higher proportion. In any case, Mr. Andrews has collected the material for a florula of Christmas island, which will enable us to gain an idea of this botanically unspoiled oceanic island. To come to a practical matter, the valuable timber known as teak on the island has been botanically identified as *Berrya ammonilla*, belonging to *Tiliaceæ*, and, therefore, no true teak in the strict sense, though undoubtedly a valuable wood. He congratulated Mr. Andrews and the Society on the excellent record submitted to them.

Major DARWIN: The speakers to-night have wisely avoided entering into the thorny question of the theory of coral reefs, and I am not the man to do so. No doubt it will be very interesting to discover *which* is the right theory; but I think the real thing to be hoped for is that *some* true theory will be found. What we want is to get a real clue to the evolution of different islands. I think Bacon spoke some of the truest words ever uttered, when he said, "Truth comes sooner out of error than out of ignorance." A man who makes a theory does good even if that theory turns out to be wrong, because it is the first step to find out what is right. So far as I can judge, there will be found to be a great deal of truth in both the theories. I think the matter is of exceeding complexity, and no one theory can account for everything. My father was a human being, and I am sure he would have been somewhat annoyed to find he was wrong; but if he had found himself wrong and Sir John Murray right, he, I am certain, would have been the first to congratulate him heartily. I also am a human being, and I cannot help hoping that my father will prove to be right after all.

The PRESIDENT: We have listened to a very fascinating paper, I think we may add an exhaustive paper, and one which shows that the author has gone through a great deal of severe work in his researches. There appear to be two ways of examining an atoll—one is by getting hold of it when under the water and by making holes in it, and that no doubt involves a great deal of work and deep-sea sounding, and I have heard from one or two of the young officers employed on the work that it is almost harder than they like; the other way is by getting hold of it when it has been raised 800 feet above the sea, and that method was adopted by our friend here, Mr. Andrews. When comparing the two kinds of work at Christmas island and at Funafuti, I am disposed to think that, considering that he had no assistance except a young lad, Mr. Andrews's work shows much greater labour than the other, where a number of officers and scientific men are engaged. I must express my admiration for Mr. Andrews at the way in which he has forced a road through this densely matted tangle of underwood, and over the jagged limestone reefs, in order to make a thorough examination of the higher plateau of Christmas Island. It is with very great pleasure that I propose to you a vote of thanks to Mr. Andrews for his most interesting paper, and for the illustrations which accompanied it. I think you will like also to express your thanks to Sir John Murray for having organized this expedition, and also Mr. Ross and his family for the great facilities and hospitality shown to our friend.

IN THE VALLEY OF THE ORINOCO.*

By Major STANLEY PATERSON.

THE excitement caused by the dispute regarding the boundary between our colony of British Guiana and Venezuela turned the eyes of many in the direction of that Republic, and procured for it a temporary notoriety that in the ordinary course of events it might never have known.

Whilst this excitement was at its highest, I happened to be casually travelling in the West, and naturally directed my attention to the country of the moment, which I then for the first time discovered was

* Map, p. 104.

practically less known to science than is Central Africa. The time at my disposal did not admit of any protracted journey on that occasion, but I made careful notes with a view to organizing at some later period a small expedition for the purpose of exploring the southern limits of the Orinoco valley, undoubtedly the richest and most fertile portion of the country. In the autumn of 1897 I was fortunate in obtaining six months' special exploring leave; so, hastily collecting sufficient kit, I sailed at once for Ciudad Bolivar, the main town on the Orinoco, and practically the western outpost of civilization in that district. At this time Bolivar, which is an old Spanish-built town, the capital of Spanish Guiana, was in a slightly disturbed state.

From Bolivar, the farthest limit of regular steam traffic, we chartered a river steamer to carry the expedition to the small village of Caicara, which had been selected as the most suitable base of operations, my idea being to ascend the Cuchivero river to its source, explore the reputed wonderful mountain of Icutu, cross the Sierra Guamapi to the head waters of the Maniapare, descending by that river and the Ventuario to San Fernando de Atibapo. In this way the expedition would pass through entirely unexplored country, and connect the tracks of two famous explorers, Humboldt and Schomburgk. From Caicara we rode leisurely to Lajitas, on the Cuchivero, the most southerly spot in the district inhabited by Venezuelans or "rationales," as they call themselves in contradistinction to the "indigenos," or Indians.

These up-country Venezuelans, while boasting of pure Spanish descent, are all freely intermixed with negroes or Indians, frequently with both, and are quite a distinct and characteristic race. They are practically divided into three classes—the ato-holders, or small farmers; the canuqua men, or squatters; and the peons, or labourers. Each class looks down on that below it, but the distinction between them is one of degree only, the general character of all being identical, and, to our practical British minds, extremely paradoxical. All are avaricious, thriftless, independent, faithless, untruthful, lazy, capable of hard work, quick tempered, vindictive, changeful, and full of laughter. Life, partly by their own fault, is hard with them; penury is their abiding condition; they daily live on the verge of starvation, frequently for lack of energy to hunt for food. But, as their actual wants are few, this seldom saddens them—they look on the whole thing as a vast joke. If there are clouds, these children of the sun see them not; nothing is really serious to them; poverty, starvation, and death only seem part of the natural order of things, and even these have their jocular side. But this very sunniness, childishness, and irresponsibility that makes these people in a way attractive and interesting, also makes them terribly hard people for the energetic European to work with, and undoubtedly the majority of the troubles that befell our expedition are traceable to our failure to comprehend these peculiarities of temperament amongst our

followers, and to grasp the leisurely and somewhat futile method of their working.

The track from Caicara to Lajitas leads across the wide savannah belt that forms the basin of the Orinoco. This undulating savannah, constantly broken by outcrops of water-worn ironstone rock frequently piled into hillocks 300 feet high, is covered with a luxurious pasturage, chiefly of rich guinea grass, on which numerous cattle of an excellent quality are reared, and is thickly studded with bushes of sweet-smelling chaparral, while in the marshier places long lines of waving moriche palms stand like bonneted sentries across the plain. The rocky "morros," or hills, are overgrown by innumerable creepers, flowering shrubs, and forest trees, amongst them the sarrapia from which the tonca bean is collected, and which gives to these hills their local name of "sarrapiales."

Naturally grass fires are common in this savannah land, and it is curious to see, during the progress of one, the crowds of long-tailed scissor birds hovering round the edge of the flame, and eagerly swallowing the smoke-stupefied insects, while on every bush or tree sits some member of the eagle or falcon tribe, intently watching for the frightened rush of some escaping small quadruped. These grass fires arise and pass quickly. After spending a whole day at Lajitas in carefully measuring and marking out a base for survey, I returned next morning to find that a fire had passed over the district, and my marks were beyond recognition. All across this savannah region the compass was practically useless for surveying purposes, owing to the quantity of iron in the rocks. At one time I found an error of 43°.

At Lajitas the *personnel* of the expedition was completed, and it now consisted of Diedrich Capellen, an enormously powerful Norwegian sailor and miner; a negro cook; twelve Venezuelans headed by one Nuñez, the chief man of the district; and myself. After the usual difficulties, caused by the unreadiness of our Venezuelan followers, we started in a large curiara, or dug-out canoe, up the Cuchivero river, here a swift-flowing stream about 200 yards in width, with high, rotten mud banks on either side, flanked by a wide belt of well-nigh impassable forest. Every few miles we came to a rapid, or "raudal," and, though all of these, with the exception of the raudal Seriapo, can be shot coming down-stream, we were forced to make a portage over them on the upward journey; hence progress was slow, and it was four days ere we reached the Caño Quebradaonda, where we took to the mountains in order to explore a lake called Laguna de la Vaca, of which our followers told many wonderful tales. We had now left the savannahs far behind, and were well in the heart of the Cerro Cuchivero, a continuation of the great range of Sierra Guamapi.

With the exception of two of our followers, half-caste Indians from Lajitas, no Venezuelans have previously penetrated this district, the

"rationale" living in holy terror of the wild Indian tribes who roam through this otherwise unpopulated country.

This march to the Laguna was our first real experience of South American mountain-forest travelling, and a very trying one it was. Over the curiously piled rocks is spread a carpeting of trailing plants that entirely conceals the treacherous holes and crannies between them, so we were soon severely bruised by constant falls, and scratched and riddled with the spikes and spines with which every plant in the country seems to be abundantly provided. Overhead the sky was hidden by the dense foliage of tall forest trees, so laced together by lianas and other creepers that only by the constant use of the ubiquitous machete could we force a foot of way.

Not a breath of air stirred in this forest land, and the closeness of the atmosphere became at times almost unbearable, so great was the relief when, after three days' hard work, we emerged on the marshy banks of the laguna. Beyond that it is undoubtedly very deep and blocks a pass 2000 feet above sea-level, between the mountains of La Vaca and La Tor, whose precipitous sides of red rock rise straight from the water's edge on either hand, we saw nothing remarkable about this laguna, which is not more than half a mile in length by a quarter of a mile in width, and is venerated by the Indians as the abode of a curiously malignant spirit.

Another day's cutting brought us back to the river in a fairly famished condition, as our small stock of provisions had given out on the morning of the third day, and, as no game could be found, we had done two days' work on empty stomachs. On the river we soon found the canoe which had been sent on in charge of four men, and continued our southward journey to the raudal Alto, beyond which point navigation is impossible, the Cuchivero here becoming simply a mountain torrent. At the Alto we halted for three days to redistribute our stores, taking with us only the actual necessaries of life made up into loads of about 20 lbs., which, in addition to blanket, hammock, and rifle, was as much as our men could or would carry. The curiara and superfluous articles were hidden in the forest.

Although we had already seen traces of Indians, we had not so far encountered them; but, being now well within the limits of their territory, were constantly on the alert—fortunately so, for during the last night we spent at the Alto some of them attempted to creep into camp, doubtless to loot, but disappeared hurriedly when the alarm was given. The east side of the river is inhabited by the Taparitos, and the west by the Panares, both wild nomad tribes of no great reputation according to the frontier Venezuelans, who say that the former are fierce and treacherous robbers, and the latter lazy, sneaking thieves. Both tribes live indiscriminately under rocks or trees, and move about in search of their food, which chiefly consists of parrots, monkeys,

and lizards. From the glimpse I afterwards had of them, they seemed of the usual South American type—squat, powerful, and absolutely naked.

From the Alto, which by aneroid and hypsometric barometer readings I made about 1900 feet above sea-level, we again faced the terrible mountain work, keeping along the ridges as much as possible to avoid the almost impassable caños and ravines near the water's edge. The trees here were much smaller than in the lower ranges, but the undergrowth was, if anything, even more dense, except when we suddenly emerged on an open slope of bare rock. On such occasions the view was magnificent, mountain upon mountain rising before us in increasing height and decreasing gradation of colouring, till the background was blocked by the lofty blue peaks of the Sierra Guamapi and the towering summit of great Icutu. This extraordinary mountain, as yet unvisited, and possibly unseen, by any other white man (nowhere can I find an account of it), is, according to my calculation, just 11,000 feet high, the base being about 2500 feet above sea-level. The sides slope steeply upward for 8000 feet, when they suddenly bulge outwards, giving the top the appearance of a gigantic button mushroom. The Taparitos, who consider this mountain sacred, say that no man can ascend it, consequently the Great Spirit lives there undisturbed. Unfortunately, the views I took of Icutu shared a common fate with the majority of my photographs, all being ruined by the unavoidable exposure to heat and damp entailed by this journey.

The difficulties of this march along the mountains were enormous, an actual advance of 4 or 5 miles forming a good day's work, as frequently, after cutting for hours towards some particular pass or bare spot, we found the way barred by a precipitous ravine or caño which took hours again to cut round. Food, too, was very short, a little rice and cassava being all we were able to carry with us. I had confidently relied on meeting plenty of deer, pig, and smaller game in this undisturbed region; but, strange to say, the upper Cuchivero seemed almost devoid of life of any description, and, with the exception of an occasional parrot, not an atom of meat had we been able to procure since leaving Lajitas. Then the Indians appeared—only a few of them so far as I could discern, though our men, whose fears were rising rapidly, declared they were in large numbers—and, after threateningly shaking their weapons at us, vanished quickly, only to reappear on the next ridge in our line of advance.

By this time the Venezuelans of the party, tired of short commons and sated with hard work, were grumbling audibly, declaring we must turn back, else we should all be murdered. We, of course, would allow no talk of retreat, and with difficulty kept the men going till after another severe wrangle, when, while I was cutting the way ahead, they all bolted back, taking their bundles with them. For some hours I

went on alone, but, being joined by Capellen and the negro, who refused to leave me, and recognizing the futility of further advance without food, we three made for the river, and tediously cut our way back to the Alto, where we arrived unmolested by the Indians, but half starved, to find the runaways just launching the canoe. Several attempts were made to induce them to face the mountains again, but, these proving unavailing, there was nothing left but to return slowly to Lajitas, where we discharged all Venezuelans without payment on account of their breach of contract. To this they replied by instituting a strict boycott, so that we could neither procure food to eat nor canoes or donkeys to transport baggage. Then they tried to frighten us by swearing information before the civil magistrate—our own late head-

Cuchinero River. El Negro. Icutu.

ICUTU AND DISTRICT.

man Nunez!—that we were revolutionary agents, the proof being that we had carried so many rifles up country to arm the natives (?) (I had armed the party with Winchesters); and, further, that on one occasion I had refused to camp on the side of the river belonging to General Crespo, and had insisted on crossing to the bank belonging to an exiled revolutionary officer! This was quite true, as that bank contained some rocks I wished to investigate.

Eight days of this childishness tired us, so one night we swam the river, appropriated a curiara that was lying some miles down the opposite bank, loaded up our baggage, and were off before daylight on a wearisome journey to Caicara by river. On the lower Cuchivero we were able to kill plenty of game, so had no further anxiety about food, and Caicara was reached in due time without misadventure. The time at

my disposal not admitting of another serious attempt to penetrate the mountain forests, I now decided on a small expedition by way of the Tortuga river to the country of the Colorado Indians, a semi-civilized tribe living just beyond the Serrania Cerbatana, in order to discover the feasibility of reaching the Sierra Guamapi by that route. Men of the right stamp for our work were, however, hard to find, and several days had to be spent hunting the country round Caicara before we succeeded in obtaining the requisite number.

Caicara, an uninteresting little village which has seen better days, is now the centre of the tonca bean industry on the Orinoco, and also does a fair trade in hides with many neighbouring atos and ranches. It boasts of a "plaza," a couple of dozen "adobe" houses, and a large church now closed, there being no resident priest, because, as the villagers themselves say, they are too wicked to have need of one! The remaining houses in the village are of the ordinary country thatched-shed kind, and the entire population is probably about 400. I make the latitude of the plaza about 7° 43′ N., and the longitude 66° 32′ W., which places it about 5 miles further west than it is ordinarily marked on the maps.

Just 10 miles to the westward the mighty Orinoco suddenly and—as the land to the north is a dead flat—most unexpectedly trends due east, and, sweeping in great volume round Caicara hill, forms a natural backwater affording excellent anchorage for boats and river steamers. Steamers of 4 feet draught can navigate the river as far as Caicara at any time of year, and in the summer or rainy season, when the river rises, as it does, 25 to 30 feet above winter-level, the way is open right up to the rapids at Perico, 200 miles further up-stream, as well as up the Apure, Meta, and numerous other tributaries. It is therefore obvious that Caicara has the makings of an important trade centre, and this it would doubtless already have become but for the inertness and want of enterprise of the Venezuelans. Our journey up the Tortuga, which is more of a creek than a river, was uneventful, except that, after ascending it for 20 miles, we found there was too little water to float the curiara, and had to take to the forest, here mainly composed of ironwood trees, very gloomy, but comparatively easy to traverse. The rocky slopes of the Cerbatana overtaxed the carrying powers of our men, and again we had to return slowly to Caicara, exploring much of the surrounding country during the down-stream journey.

The Tortuga takes its name from the numerous river-turtles that congregate in it during the months of March and April, the long shelving "barrancas" or sandbanks at its mouth being one of their favourite nesting-places. At this time canoe-loads of natives come from all parts of the river to collect eggs, and annually thousands of wretched turtles, worn out by the act of maternity and too weak to move, are slaughtered for the sake of their shells, which are freely used as

basins and cooking-pots in every Venezuelan household. This river is also the haunt of myriads of birds of all descriptions, great and small, many of them quite unknown to me, and a short sojourn on its banks would, I believe, well repay a collector.

Throughout the entire Orinoco valley, orchids—chiefly, to be sure, of fairly well-known varieties—flourish in great beauty and abundance, and it is surprising that no enthusiastic hunter has yet reached the fastnesses of the upper Cuchivero in search of rarities. One, a German, the only white man, so far as I can learn, who has preceded me on the Cuchivero, did get as far as the raudal Piñal some fourteen years ago, but returned suddenly, for what reason the natives could not tell me.

From a commercial point of view, this country should be of great value. The rich rolling savannahs will rear countless herds of cattle and horses. The surrounding forests yield large quantities of natural products, such as rubber, copaiba, quinine, simaruba, and other drugs. The forest trees are of magnificent growth and endless variety. In the Cuchivero valley we saw mahogany, cedar, copaiba, simaruba, three species of hevea (*braziliensis*, *sprucii*, and *pauciflora*, I believe), castilloa, quina or cinchona of two varieties, red and yellow, numerous different trees belonging to the Ficus family, and many others unknown to me, or only known by their native names. The upper waters of the Guaniamo are so affected by the sarsaparilla that grows profusely along the banks, that the natives drink the water and bathe there, in order to cure themselves of skin diseases, to which they are peculiarly liable.

Traces of gold, silver, and cinnabar are to be found in the mountains, but, from the peculiar formation of the rocks, I doubt the existence of these metals in anything like paying quantities.

The fauna of the country is in all respects similar to that usually found in the northern states of South America. The jaguar and ounce (*Felis onca*), classed as one in most natural history books, but always treated as separate animals by the natives, infest the dense forests, and are held in great dread by the country people, several of whom annually fall victims to these fierce marauders. We met two hardy brothers who went about killing these animals, one armed with an old gun loaded with nails, and the other with spear and machete. Their *modus operandi* was to track the animal till he was sighted, when the brother with the gun treated him to a dose of broken iron, the other brother meeting the immediately induced charge on the point of his spear; then both quickly despatched the impaled quarry with the ever-ready machete. These men had just killed a magnificent animal when we encountered them. The puma, which frequents the hills, is considered a coward, and is consequently little feared. The steamy jungles by the river-banks are the haunt of the great grey tapir, the harmless

capybara, or water-hog, and that truculent little pig the collared peccary. Morning and evening hundreds of deer (*Cervus savannensis*) emerge from the forest shade to feed on the sweet savannah grass; but these little fellows are extremely wary and difficult to get at. Monkeys are few and far between, possibly because they are so killed down by the Indians for food. In the rivers are a fair number of manatee, and while peacefully floating down-stream, one is frequently startled by the strange hissing snort of the giant otter (*Lutra braziliensis*), an animal quite four times the size of his English prototype. We captured a pair of pups—quaint, noisy little chaps, which lived in camp with us for many weeks and became quite tame. Unfortunately, both died suddenly on board ship, much to my regret, as I hoped to bring them home alive.

Bird life, as I have already said, is most abundant, the poverty-stricken squatter having a hard battle to save his fruit and corn from the incessant attacks of these winged robbers. Snakes are plentiful, chiefly boas and a very poisonous species called by the natives "mapanaré." These snakes usually lie coiled up on the branches overhanging the river, and strike quickly downward at anything passing beneath. We had the curious experience of killing seven great boas, lying all together, the largest measuring 20 feet 8 inches, and the smallest 12 feet 9 inches in length. Alligators, many of enormous size, iguanos, and lizards are everywhere.

The Orinoco is full of fish of many varieties, amongst them the "valenton," a kind of tarpon, the voracious carib fish, electric eels of great size, and a curious fish called "paillara," somewhat resembling a salmon, but with large tusks working through callosities in the nostril, and a fearsome row of teeth behind them.

This part of Venezuela teems with insects, especially of those kinds most disturbing to the peace of man. Mosquitoes, sandflies, and a small stinging beetle make life a burden to the new-comer, who, try as he may, can find no effective means of eluding them. Every step in the unburnt savannah covers one with grass-ticks, and an occasional tender tickling about the toes suggests that a friendly jigger has ensconced himself comfortably beneath one's skin, only to be ejected by ultimate unpleasant carving.

There are but two seasons in Venezuela—the wet, lasting from about the middle of April till the first week of September, and the dry. In the latter season the climate is far from unhealthy, and, except when the easterly breeze drops, the temperature is not unduly warm. This easterly breeze is the saviour of the Orinoco valley. Every morning, about four o'clock, the leaves begin to rustle, and soon the trees are swaying and creaking in the freshening wind—sometimes half a gale—that sweeps away the swamp mists, searches out and dries up the heaps of reeking vegetation, and generally acts as a great purifier till about

eleven o'clock, when it suddenly dies away, and the sun beats down in all his fierce heat on river, plain, and forest. Then the world goes to sleep; not a leaf stirs, not a sound is heard, not a living creature moves, unless it be some tireless, persistent and perspiring Briton, who refuses to time his incomings and his outgoings according to the great clock of Nature. At two o'clock another whisper runs through the trees, and again the sweetening wind brings life back to the forest, continuing to blow strongly all afternoon, till it sinks to rest with the sun behind the fiery western clouds.

During the winter months there is but little rain—we had only three wet days in fourteen weeks—but the constant night dews are sufficient to soak through blankets and clothing, and make every one cross, stiff, and unhappy by morning time. Once or twice the cold at night was too great to permit of sleep in such light covering as we were able to carry, and the night had to be spent by all of us cowering round the camp fire. The appended table shows the approximate temperature at various stages of our journey. For lack of proper instruments, I was unable to register the humidity of the atmosphere, which was considerable.

Apparently no relics of any previous civilization exist in this part of the country, nor, with the exception of two deeply cut circles on the rocks in the middle of the river both at the raudal Seriapo and the raudal Alto, could we find any trace of Indian carving or picture-writing. On the Tortuga we discovered the remains of an ancient village, which had evidently been built out on piles over the river, whose bed—almost dry at the time of our visit—was thickly strewn with fragments of broken pottery, mostly bearing quaint and well-formed designs. Their age is not easily determined, but, as the Indians in the district have now lost the art of making pottery, they are probably of considerable antiquity.

Contrary to expectation, we found the people all over the Orinoco valley most friendly to the English, whose business qualities they respect, and disposed to view the boundary difficulty as merely a question of brag, out of which their own politicians, whom they distrust, hope to aggrandize themselves in some unexplained way.

I am fully convinced that this valley will one day develop into one of the richest commercial centres in the West, but its development requires capital, and English capital is naturally shy of entering the country in the present unsettled state of affairs.

APPENDIX I.

AVERAGE TEMPERATURE AS TAKEN BY SPECIAL TRAVELLING THERMOMETERS, KEW NOS.

Approximate altitude in feet.	Place.	Average.		Highest maximum reading.	Lowest minimum reading.	Remarks.
		Maximum.	Minimum.			
800 to 1100	Savannahs	87° 20′	75° 10′	88° 40′	73° 0′	* A specially cold night at the highest altitude we reached.
1100 to 1900	Cuchivero river	85° 30′	72° 0′	88° 0′	69° 0′	
1900 to 2600	Cerro de Cuchivero	82° 20′	61° 0′	87° 20′	54° 0′ *	

APPENDIX II.

(*a*) APPROXIMATE HEIGHTS OF PRINCIPAL CAMPS.

Camp.	Height in feet above sea-level.	Remarks.
Caicara	800	Calculated from the mean of aneroid and hypsometric barometer readings.
Lajitas	1300	
Raudal Alto	1900	

(*b*) APPROXIMATE HEIGHTS OF PRINCIPAL MOUNTAIN PEAKS.

Mountain.	Height in feet above sea-level.	Remarks.
Anapui	3,200	Calculated trigonometrically from above camps.
Queabradonda	2,900	
El Negro	4,000	
San Vicenti	2,400	* Three mountains above the Alto so named by us on account of the similarity of their appearance.
Los tres Hermanos * ...	4,300	
Icutu	11,000	

NOTES ON THE MAP.

The map is framed on a combination of—

(1) Plane-table survey.
(2) Prismatic-compass survey.
(3) Astronomical survey.

The entire land work was done by plane-table, the compass proving unreliable, owing to the amount of ironstone in the rocks. The original base was carefully measured along the river-bank at Caicara, and from this the point of Caicara island was fixed. This new base, Caicara—point of Caicara island—became the primary base of the survey. Subsidiary bases at Vainas, Bucaral, and Lajitas were interpolated from mountain peaks already fixed. As, however, it was seldom possible to fix identically the same spot on these mountain-tops, some slight error may in this way have crept into the work.

A new base was formed at Lajitas by measurement and extension—the ground

being too rough to measure correctly a sufficiently long base for the work—and a subsidiary base was interpolated at the raudal Alto. Later subsidiary check bases were interpolated at Punta Capuchino and Laguna de la Guaya; more, possibly, by good fortune than by good guidance, these checks worked out with wonderful accuracy.

The river work was done by prismatic compass and time survey, and is necessarily somewhat inaccurate, the varying strength of the current and the somewhat intermittent work of the paddlers making it extremely difficult to gauge with any degree of accuracy the real distance travelled. The compass also seems to have been affected by the ironstone, as was the case on land. The points fixed astronomically were—

Caicara.—Latitude by meridian altitude of sun, 7° 43′ N.; longitude by morning sights (sun), 66° 32′ W.

Lajitas.—Latitude by meridian altitude of sun, 66° 55′ 8″ N.; longitude by chronometer and four altitudes of Aldebaran, 66° 15′ 18″ W.

Randal Alto.—Latitude by sun, 6° 31′ 30″ N.; longitude by chronometer and sun, 66° 16′ 8″ W.

Mouth of Cuchivero.—Longitude by chronometer and altitude of Procyon,

Punta Capuchino.—Latitude by sun meridian, 7° 39′ 32″ N.

Mouth of Tortuga.—Latitude by sun meridian, 7° 16′ N.; longitude by morning sun and chronometer, 66° 56′ 16″ W., 66° 13′ 40″ W.

Owing to want of practice and experience in astronomical work, I am very doubtful as to the correctness of any of these observations, and, in placing these points on the map, have usually preferred to rely on the mechanical accuracy of the plane-table rather than on the more dubious results of inexperienced astronomical observation. The factors from which these results were obtained are attached hereto—at least, such as remain in my possession. Unfortunately, owing to the capsizing of a canoe in the Tortuga, the remainder were lost, though luckily the results of the calculations had been already committed to the map.

The entire work was completed under circumstances of considerable difficulty, as, except in the savannah country, the stars were rarely visible through the dense forest trees; all night work was rendered inaccurate, owing to the constant heavy dews, which dimmed the sextant glasses before contact could be obtained, and the continual interruption of work caused by the unbearable irritation from the bites of thousands of mosquitoes and other troublesome insects. I do not, therefore, claim that this is a complete and correct survey, but consider that it is nearly so, and much more accurate than any of the antique existing maps.

THE PROCEEDINGS OF THE PAMIR BOUNDARY COMMISSION.

THE report on the Commission for delimitating the Russo-Afghan Boundary on the Pamirs has at length been given to the public. This commission left India in June, 1895, and returned in October of the same year, so that the report is about three years old.

It contains an account, by Major-General M. G. Gerard, of the arrangements preliminary to delimitation, and of his journey subsequent to the completion of the boundary through Russian Central Asia to Europe. The narrative of proceedings during delimitation has been

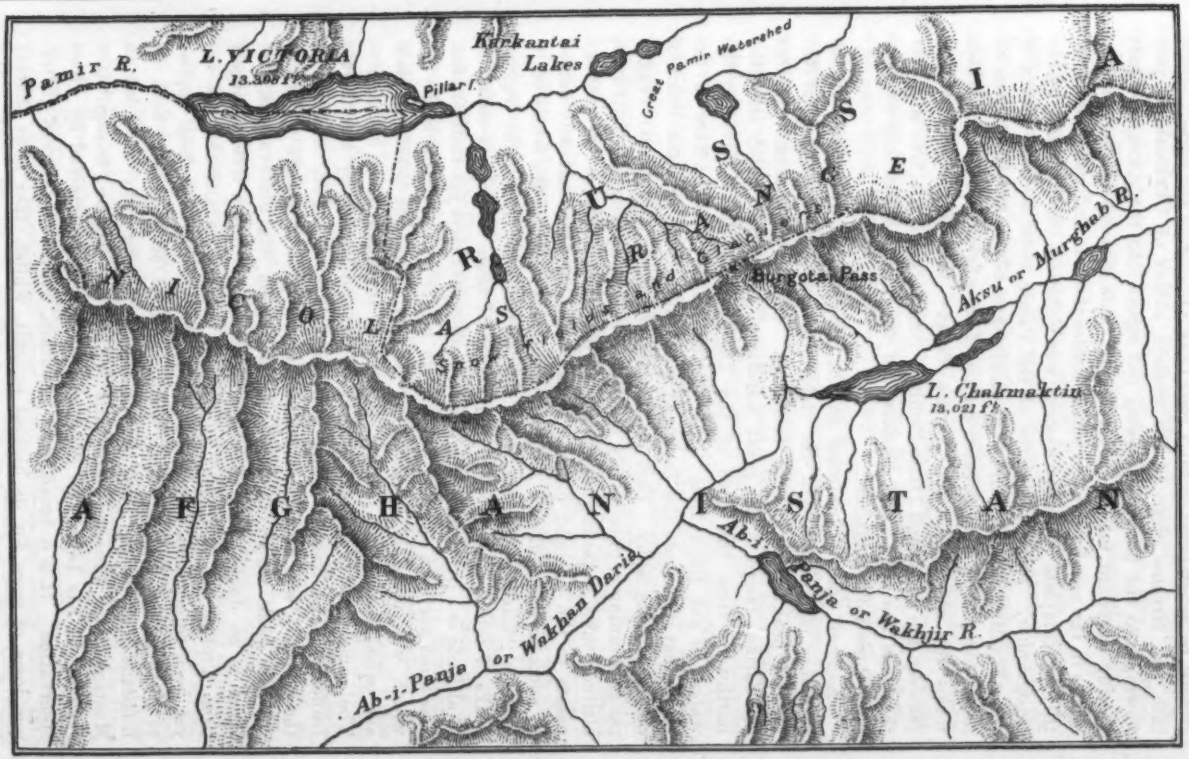
written by Colonel Holdich, R.E., together with the historical and geographical notes of the Pamir region. The survey report is by Lieut.-Colonel Wahab, R.E., and the natural history section by Surgeon-Captain A. W. Alcock. The last is both interesting and valuable, and (in common with the rest of the report) is excellently well illustrated; but it is to the geographical sections of the report that we wish to call attention at present, as they appear to throw fresh light on certain debatable points in Central Asian geography, and to clear away the mists that have hung so long around the sources of the Oxus.

The first pillar of the boundary was set up at the eastern end of Lake Victoria, and this point was selected, together with one near the end of the demarcated line, for comparison between the Russian and English values in latitude, longitude, and altitude, to serve as the datum, or basis, for all the surrounding survey. The results of the comparison are given by Colonel Wahab, and they are certainly satisfactory; for they exhibit no divergence of opinion whatever as regards longitude; only a small one in latitude; and none to speak of in altitude. In fact, the Russian mapping of these regions is entirely in harmony with the Indian mapping, and it may safely be assumed in future that Russian values are practically identical with our own. The longitude agreement is of special interest when we consider how it was obtained. Direct geodetic triangulation connects the western shores of the Caspian sea with Greenwich—some 2200 miles—across the intervening states of Europe. Here for the present it ends, and the Russian longitudes of their Central Asian possessions to the east of the Caspian depend upon telegraphic determinations only. For about another 1000 miles from the Caspian to their military post of Osh the telegraph is thus responsible, and Osh was, two years ago, the nearest point so fixed relatively to the scene of demarcation on the Pamirs. From Osh to the boundary-line (about 80 miles) the longitude values were brought down by chronometric deduction, a very fine battery of chronometers being carried in circuits till it touched the field of operations.

On the English side, the longitude of India is derived from Greenwich by telegraphic determinations, and the longitude of the Lake Victoria pillar was derived from India by direct triangulation, which was carried from Gilgit across the Hindu Kush into the Pamirs. Although it was improbable in either case that any large absolute error should exist, it was quite possible that a difference might have been found on comparison of final results, which would be appreciable on the scale of mapping. It was, therefore, a matter of congratulation that the accordance should be as absolute as it proved to be when that comparison was made. Latitude was, of course, determined on the spot by means of astronomical observations; but the Indian Survey determination was additionally fortified by the value derived from triangulation, which agreed absolutely with the astronomical deduction. In altitude, again,

there was little to adjust between the trigonometrical values and the barometric determinations of both Russian and English surveyors. We may safely assume that the Pamir altitudes are now definitely fixed.

The height of Lake Victoria was trigonometrically fixed at 13,390 feet above the sea, a result which is in agreement with the barometrical determinations of the Russians, and which differs from Captain Trotter's value (determined during the progress of the Forsyth Mission) by 560 feet. Trotter makes the altitude too great. His observations were made in the unsettled spring weather, when single barometric determinations are of little value. It is curious that Wood should make its altitude 15,600 feet in mid-winter by hypsometer observations. Lake Victoria is only 400 feet higher than Lake Chakmaktin (the "Gazkul" of the Little Pamir), and about 500 feet below the watershed of the Great Pamir. One principal source of the lake is an affluent 14 miles long which rises in the northern slopes of the valley, not far from the pass across the watershed leading eastwards to Jarti Gumbaz. This affluent, known as the Yangi Diwan, flows through two small lakes, each about half a mile square, lying close under the saddle of the watershed. The mountains enclosing the lake run to 5000 and 6000 feet above the water-level on the south, where they culminate in the vast glacial system of the Nicolas range dividing the Great and Little Pamirs; and to about 4000 feet on the north. There is another system of lakes which drain into Victoria, hidden in the northern slopes of the Nicolas range, through which immense volumes of glacial water pass down. There is, however, strong evidence that Lake Victoria is gradually silting up, and that it will in process of time cease to exist in its present form. Neither Lake Victoria, which long held its own as the reputed source of the Oxus, nor Lake Chakmaktin, which was for years its great rival as the source of the Aksu, can properly be called a source at all. Both of them appear to be but incidents in the construction of the water-channels of the Pamir river and the Aksu respectively. Of both of them it is said that they are fed by warm springs, but in neither case are these springs sufficiently apparent to justify the supposition that the lakes, rather than the glacial streams which feed them, are the fountain-head of the rivers to which they belong. There are several lakes above the level of Victoria, any one of which (except for the accident of size) might apparently claim equally with Victoria to represent a source. The confirmation of the upper drainage of the Chakmaktin is peculiar. Early explorers represented the lake as having two outlets—one eastward to the Aksu, and the other westward to the Ab-i-Panja. Later explorers maintained that the lake drained only to the eastward, and that it was the source of the Aksu-Murghab river only. Neither view is entirely correct, though the former perhaps more nearly approaches the truth than the latter; for the headwaters of the Aksu, which originate in the glaciers of the Nicolas range (which,



SKETCH OF SOURCES OF THE OXUS RIVER.

Scale about 8 miles = 1 inch.

it must be remembered, equally feed Lake Victoria on the north), divide into two streams close to the western shores of Chakmaktin, part flowing into the lake and passing out again into the Aksu, and part flowing westward into the Ab-i-Panja. This division of the drainage occurs in the marshy swamps which border the lake, and was unobserved till the complete drainage system was followed out in detail by the topographer. Thus the source of the Pamir river, and the source of the Aksu-Murghab, as well as the chief source of the Ab-i-Panja are *all* found together in that elevated region of snowfields and glaciers which forms the summit of the Nicolas range — the dividing watershed between the Great and Little Pamirs. Surely, then, the true source of the Oxus lies amid these glaciers; for no single affluent can compete with these three combined.

Another point of interest in the geographical researches of the boundary commission was the determination of the position of the highest peak north of the Himalaya. It will be remembered that the Sarikol range is the great meridional watershed which stretches northward from the head of the Tagdumbask Pamir, dividing the waters of the Oxus from those of the Tarim basin. This is the range that represents the Taurus of classical authors, and the Bolor of mediæval geography. East of this watershed is a high and rugged range, running approximately parallel to it, but topping the Sarikol in altitude, through the mighty gorges of which the eastern Sarikol drainage passes to the Kashgar plains. This range has been variously named by successive travellers. As a comprehensive name for the whole of it, perhaps "Kashgar" is the most appropriate. On it are the highest peaks of this northern region; but which of them claims pre-eminence in altitude is a question which Russian surveyors have yet to determine. The most northern of these peaks is in lat. 38° 35′, and this is the one which was probably observed by Trotter from the Kashgar plain and called Tagharma. Trotter determined its height to be 25,000 feet. The same peak was seen by Ney Elias, and named by him Mount Dufferin. The Russian maps, however, call it "Kangur," and this is the name it will be known by in future. Trotter assigns a position for the peak which throws some doubt on his observations, but there is no doubt that the Russian position (which differs largely from Trotter in longitude) is correct, though its altitude has not yet been determined. Trotter's height (25,000 feet) has been applied to another peak further south, which is called Mustagh Ata both by Russians and by the great explorer Sven Hedin, who ascended it. Mustagh Ata, however, now falls within the Indian triangulation system. It has been well fixed, and its height ascertained by direct observation. It is a broad, bold mountain, with a magnificent glittering dome of snow for its highest summit, whilst other more sharply defined pinnacles of less altitude support the dome on either side. The

height of the dome is 23,480 feet, and the height of an outlying pinnacle 22,780 feet. It will be a matter of interest to learn, when the Russian trigonometrical survey closes on the boundary, whether Kangur or Mustagh Ata is to rank as the highest mountain north of the Himalaya.

Perhaps the most interesting of all the investigations connected with the Pamir boundary is that which traced out the ancient lines of communication with India. Those routes which lead directly from the Pamirs towards Chitral, Gilgit, and Kashmir have never yet been traversed by any military invading force moving southwards; neither have they been used by any of the countless irruptive hordes of Central Asia, seeking new countries and thirsting for the wealth of Hindustan, who have from time to time left the north-west borderlands of China and poured over the boundaries of India. The course of these irruptions can still be faintly traced in history, or be gathered from modern ethnographical evidence. This subject is dealt with in the historical section of the report, which points out that the only travellers through these most inhospitable regions who have left any authentic record behind them are the early Buddhist pilgrims, who made their way either alone or in small parties by the most direct route, in quest of the great centres of their faith which existed between the Hindu Kush and the Peshawar valley, east of the country of the Kafirs. Chitral, Dir, Gilgit, Darél (an almost unexplored district), and Swat were all under the influence of Buddhism till late in the Middle Ages.

These Chinese pilgrims, who set out from Northern China as scholars and returned as missionaries, seem to have explored every route in existence which led to the great Buddhist cities in Swat and the Kabul river valley. Fa Hian, who started about the year 400 A.D. from Kansu, crossed the desert of Gobi to Khotan. There he found a flourishing Buddhist community. From this point his route has been much discussed, but the topography of the districts between Khotan and India appears to decide it. He journeyed twenty-five days towards the country of Tseuho (rightly conjectured to be the Yarkand district), from which he says there is a caravan route due south into the mountain region of Tsungling. After a month he reached the country Kiesha, in the Tsungling mountains. Another month across these mountains brought him to Toli, which has been identified with the valley of Darél, south of Gilgit. After fifteen days' further advance towards the south-west, he struck the Indus, and, crossing it, he reached the kingdom of Udyana. If we accept Tseuho as identified with Yarkand, and Toli with Darél, there exists but one possible caravan route "southwards," by which Fa Hian could have travelled. This is the route which traverses the Hindu Kush by the Baroghél pass, the Baroghél having been a recognized caravan route through all ages. And there is no *known* route into Darél from the north, except that which passes through the Gilgit

valley. But where is Kiesha? It seems possible that Kiesha, "in the centre of the Tsungling mountains," may have been Chitral, which is called also Kashkar. There is interesting evidence that Chitral was once Buddhist, and Fa Hian's graphic description of the place tallies well with what we now know of it. There is also the probability that so earnest a pilgrim as Fa Hian would endeavour to visit all Buddhist places that he could compass on his pilgrimage. After leaving Kiesha, he continued to wander amongst the mountains for a month, and he followed a road "where there is snow both in winter and summer;" where there are "poison dragons who spit poison; winds, rain, drifting sand, and gravel stones," and the people of that land are called "snowy mountain men." A climate such as this implies that his wanderings kept him in the northern hills and amongst high altitudes, and the topography of the country indicates that he followed the route to Gilgit, subsequently made famous by the march of Kelly's relief force. There are many evidences of the former vitality of Buddhism at Gilgit, especially about the narrow defiles and "durras" which lead to Darél. There are the remains of a stupa at Hunzil (about 10 miles from Gilgit), as well as rock-cut figures and inscriptions. About Darél itself we unfortunately know very little beyond what is contained in the report of a native surveyor, who traversed it in 1876. He describes its fertility and the growth of vines in the valley, but says nothing about Buddhist evidences. From Darél, Fa Hian's graphic description of the next fifteen days' journey along the Sintu-ho (Sindhu, or Indus), till he reaches the Udyana plains, leaves little doubt about the position of his final entry into India. Sung Yun, in 518 A.D., seems to have followed the same route. Hiuen Tsiang, in 630 A.D., followed the trade route from Northern China to Tashkent and India, and returned *viâ* the Pamirs.

Incidentally, the limits of the ancient kingdom of "Bolor" are traced out on the historical notes of the report; and there are references to the ancient Christian communities of Asia, and the survival amongst the Sarikolis and Kirghiz of fragments of Christian ritual in their ceremonies of to-day.

The grass highland valleys of the Pamirs are described, and the passes connecting them; but there is not much more to be said than has already been said by former travellers about the physical appearance of that elevated tableland. It has its picturesque aspects during the short summer season; but the empty desolation of those snow-covered wastes for the rest of the year drives even the hardy Kirghiz nomads to lower altitudes and more hospitable climes. They are occasionally visited by huntsmen in search of *Ovis Poli*, but are more usually left in silent desolation to the cold sweep of winter storms and the fierce grip of winter cold.

DEEP-SEA EXPLORATION OF THE EAST INDIAN ARCHIPELAGO.

THE Dutch Government has placed at the service of the scientific men of Holland the newly built man-of-war *Siboga*, 820 tons. She has been fitted out with a Le Blanc sounding apparatus, a small Lucas sounder, and also an electric cable-drum capable of holding 10 kilometres of steel cable. Besides the usual trawls and dredges, the zoological equipment includes all necessary apparatus for plankton, and littoral and deep-sea investigations; there are also meso-plankton nets of various construction on board, including those made use of by Tanner, Chun, Fowler, and others. For the physical investigation of the ocean the expedition is also fully equipped. A room in the forepart of the vessel has been fitted up as a laboratory.

The necessary money for the equipment and cost of the expedition has been supplied partly by Government, partly by learned societies, and partly from private sources. Their Majesties the Queen and Queen Emma have also given their help. The ship will be commanded by Captain G. F. Tydeman, who will have under him two other naval officers. The scientific leader of the expedition is Prof. Max Weber, who sailed on October 28 for India, *en route* for Surabaya, in Java, to take charge of the investigations. He is accompanied by his wife, Mevrouw Anna Weber van Bosse, who will study the algæ of the archipelago. His assistants are Dr. J. Versluys, Mr. H. F. Nierstrasz, and Dr. A. H. Schmidt. For several months past Prof. Weber has been engaged in fitting out his expedition, and has interviewed Sir John Murray, Prof. Chun, and others, both with reference to the outfit and to the nature of the work to be undertaken.

The object of the Dutch deep-sea expedition is the zoological, botanical, and physical investigation of the marine area of the East Indian archipelago, particularly of the deep basins of its eastern portion. The *Siboga* sailed from Amsterdam for Java on December 12. The work of the expedition will commence early this year, and the investigations are expected to extend over two years. The proposed route is as follows: Starting from Java, the different instruments and apparatus will be tested, and preliminary observations made, in the shallow water south of Madura. Then sailing east, attention will be directed to a region more than 1000 metres (550 fathoms) in depth, connected with the Indian ocean by the Lombok strait, which strait will be thoroughly examined down to the greatest depths. The course then lies along the Allas strait, where within a distance of 60 miles the water shoals from 4000 metres (2190 fathoms) to 100 metres (55 fathoms). Along this steep slope serial temperature and density observations will be taken. Thence the *Siboga* will proceed to the Postillon and Paternoster islands, the examination of which is desirable because they lie

exactly on the supposed border-line between regions with and without true coral reefs. True coral reefs are apparently almost entirely confined to regions north and west of a line from Pontianak, in Borneo, and Riouw, and east of a line drawn along the east coast of Borneo from Cape Kamiangan to the southern point of Celebes, and thence to Bima, in Sumbawa. Within the region bounded by these lines (in contrast to the eastern portion of the archipelago) true coral reefs, if present at all, are poorly developed, or are found in a raised condition. An attempt will be made to ascertain the reason for this, and in this connection the distribution of the plankton will be carefully studied. From these islands the route will be continued to Bima, across a small basin in which soundings have shown a depth of 3900 metres (2130 fathoms). Possibly an examination of the bottom-fauna may throw light on the age of this basin, and show whether its origin has any connection with the eruption of Tamboro. Thence the route will be through the Sapie strait and along the west coast of Sumba for a distance of about 70 miles, the depth of water increasing from 40 metres (22 fathoms) down to the deep sea. Along this slope, as in the region south of Lombok, serial observations will be taken at various depths, and the nature of the fauna investigated. In order to arrive at more definite conclusions regarding the physical conditions of the ocean water, and the character of its fauna, the investigations will be continued south of Sumba, and then the expedition will cross the low ridge between Sumba and Savu, and penetrate into the deep basin between Flores and Timor. Thence the route lies over the ridge between Ombaai and Pulo-Kambing separating the Timor basin from the deep Banda sea. The temperature and other conditions in this sea, which is shut off from the Pacific and Indian oceans by high ridges, at least as far as the deeper waters are concerned, are well worthy of further research, which may assist in the solution of certain problems suggested by the *Challenger* and *Gazelle* observations. It is desirable to cross the boundary ridge of this deep basin at two other places for the sake of serial observations, viz. first between Dammar and Tjan, in the direction of Tenimber, and second about lat. 5° S. and long. 130° E., where the slope into the Banda sea must be very steep. After an extensive examination of the Banda sea, the voyage will be continued eastwards to the Aru and Ki islands. The *Challenger* observations have shown that the bottom in this neighbourhood is covered by an exceedingly rich benthonic fauna; thus two hauls of the trawl in 129 to 140 fathoms produced over four hundred specimens of marine invertebrates and fishes, belonging to about 167 species, of which no fewer than 132 species (or four-fifths of the total number) were new to science, including representatives of 32 new genera. Thence the route crosses the ridge between Buru and Ceram (Manipa strait), which is over 3000 metres (1640 fathoms) below the surface of the sea. Serial temperature and

density observations will be taken during the passage from the Banda sea to the Ceram sea, as well as in the Ceram sea and eastwards from it, and especially in the Molucca strait west of Halmahera, with the view of solving the question as to the possible inflowing of deep water from the Pacific into the Molucccca strait. As this might occur between Halmahera and Talaut, the investigations (both physical and biological) will be continued from Talaut eastwards as far as long. 129° E., where the bottom of the Pacific attains a depth of 4000 metres (2190 fathoms), so that it will be possible to institute a comparison between the fauna of, and the physical conditions obtaining in, these different regions. Thence the expedition will sail northwards from Sangin into the Celebes sea, which will be crossed in several directions, thus making it possible to form an accurate idea of the outline of this deep basin, and the results may throw light on the age of the Celebes and Banda seas. During the further course through the Macassar strait, and especially in the southern portion, the quantity of plankton will be studied in connection with the abundance of fishes and the massive development of corals in the Spermonde archipelago. After such a careful examination of the deeper eastern seas, and the ridges separating them from each other and from the Pacific and Indian oceans, an increased interest will attach to the investigation of the shallow Java sea, and the peculiarities in the hydrography and fauna of the different basins will stand out in greater relief.

MAP OF THE SHIRE HIGHLAND DISTRICT OF BRITISH CENTRAL AFRICA.*

By ALFRED SHARPE, C.B.

THIS map has been compiled by the Survey Department of the Protectorate Administration. The bulk of the work has been done by the Indian Surveyors lent to the Protectorate by the Government of India, under the supervision of Mr. William Anderson, chief surveyor.

The greater part of the surveys has been carried out in connection with the delimitation of various estates claimed by and granted to Europeans. Where gaps occur between different surveyed blocks, these have been joined up by triangulation. The map represents three years' work.

The instruments used were, in the first instance, generously loaned by the Royal Geographical Society to the Protectorate; and but for their ready help, and for the constant assistance given by the Indian Government, we should have experienced many more difficulties in our work in British Central Africa than has been the case.

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* Map, p. 104.

A vast amount of survey work remains to be carried out in the Nyasa regions, and if our local Survey Department could deal with this for purely geographical purposes, we could doubtless more speedily arrive at interesting results. It is necessary, however, to take in hand a large quantity of work connected with ordinary sales of estates, purchases of crown land, etc.; and the endeavour is to join this in as much as possible with such other more general and interesting work as there is time for. The work of the Indian surveyors has been excellent. They soon get used to the Central African climate, and stand it better than Europeans; they are able to carry out work which would be hardly possible for Europeans in that country.

LAKE TRASIMENE.*

By Prof. PAUL CHAIX.

Lake Trasimene, of permanent historical interest, is a sheet of fresh water of 50 square miles in extent, not more than 12 feet in average depth, 10½ miles in length, and 6 miles in width, with an irregular shape measuring nearly 40 miles along its shores. It is surrounded with smiling, picturesque hills, studded with old castles and splendid olive groves, a salubrious tract in the natural condition of its waters. But they are deprived of any natural outlet, and find an inadequate discharge in a small, tortuous, and choked ditch, the construction of which is ascribed by some to Roman times, and by others to the famous Braccio da Montone, lord of Perugia, a rival of Attendolo (Francesco Sforza). That silted-up ditch was in no condition to allow a free discharge to the occasional deluges of rain collected by a basin of over 100 square miles of surface. The waters rose sometimes 9 feet above their average level, converting a belt of well-tilled land into unwholesome swamps. The fever-stricken and helpless inhabitants bore the scourge for centuries, without any relief from the Pontifical government, which imposed absurd regulations on navigation and fishing. The Italian government went so far as to grant a concession for the complete drainage of the beautiful lake to speculative adventurers, happily without the pecuniary means for carrying on the work.

The year 1875 having been marked by a flood of uncommon height and duration, patience was at an end amongst the surrounding population; a general meeting, convened by Cavaliero Guido Pompili, on September 24, 1877, resulted in the formation of a committee for the construction of a canal of proper size and slope. Cavaliero Guido

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* Consorzio del Trasimeno. Quadro Sinottico della sua Storia, 1875, 1898. Perugia, 1898.

Pompili was, notwithstanding his youth, called to the chair, and holds it to this day. The next two years were spent in the necessary measurement of depth, variations, volume of the lake, slope, and traverse of the intervening country to the basin of the Tiber. But the bill had to be carried through the slow discussions of all sorts of corporate bodies, provincial, sanitary, parochial, agrarian, etc., meeting everywhere with stupid opposition. It was, in 1891, submitted to the examination of three engineers of high standing, Brioschi, Cadolini, and Coletti, whose report, given in March, 1891, estimated the expense at 1,733,000 Ital. lire (£68,120), entirely borne by the committee. A royal decree was not, however, granted before July 14, 1895, authorizing the execution of the long-delayed work under a commission whose chairman was the sanguine and clever Cavaliero Guido Pompili, with several engineers, including Marquis Ruggiero di Sorbello and Count Francesco Conestabile.

The canal is, at its origin, 800 feet above the level of the sea, 30 feet broad, with sloping sides, discharging into a trapezoidal basin 48 feet long, and by a tunnel of elliptical section of 10 feet height, 11 feet width, and over 3000 feet in length, is carried under the hill and village of San Savino del Lago. At its outlet the waters are carried 800 feet through a walled reach, and lastly, by a trough over 3 miles long, to the little river Caina, a tributary of the Tiber.

The works were very briskly carried on, and ended in the opening the upper reach, a difficult matter in the swollen condition of the lake. The maximum discharge of the new canal being 12 cubic metres per second, it was calculated that twenty-four months would be required for the outflow of the 205,000,000 cubic metres, the volume of the waters above the new adopted level giving to agriculture 2470 acres of excellent land, and protecting an equal area against the swampy condition which had given a bad name to that country.

The works were completed on March 15, 1898, within two years, at an expense of 658,565 Ital. lire, instead of 1,733,000 given by the former official valuation. Soon afterwards the canal was submitted to engineering examination, and, on September 27th, 1898, solemnly opened in the presence of a part of the ministry, of many lukewarm authorities and of an immense and elated population.

PROF. SUPAN ON THE RAINFALL OF THE GLOBE.

By A. J. HERBERTSON.

THE necessity for accurate knowledge of rainfall in agricultural, engineering, and other practical problems, has led to a great extension of the number of rainfall stations in recent years, and sufficient data have now accumulated to warrant the construction of new rainfall maps. Prof. Supan in Germany, and the writer in this country, have independently undertaken the task. Prof. Supan has recently

issued two important papers dealing with the annual distribution of rainfall over land and sea, and with the seasonal distribution and annual range of precipitation over the land, and giving rainfall tables as well as rainfall maps.*

In selecting the data, Dr. Supan has overlooked two important works, Prof. Wild's newer means for stations in the Russian Empire, published in 1895, and Dr. Angot's tables for Western and Central Europe, where the means are reduced to a uniform thirty-year period. On the other hand, he has made use of Mr. Eliot's data, published in the Indian *Annual Summary* for 1896, and noted Dr. Buchan's recent monograph on the rainfall at the Cape in an appendix.

The mean values for the ocean are derived from Dr. Black's revised figures in the *Journal of the Manchester Geographical Society*, plus the data obtained by the *Novara*, *Gazelle*, and *Elisabeth*, from which the mean rainfall per rainy day in the different zones of each ocean is calculated, and the probable annual precipitation is obtained by multiplying this by the mean number of rainy days per year, *using only German observations*. This is the first map of rainfall over the oceans.

The most striking feature in the new annual rainfall map for the ocean is the great area of excessive rain (over 2000 mm., or 80 inches per annum) over the Atlantic between Newfoundland and Ireland, and the westward extension of the Sahara conditions (rainfall under 250 mm., or 10 inches) to 65° W. This parched area practically does not occur in the South Indian ocean, and in the South Atlantic only as a very narrow tongue running north-west from the Kalahari desert, in the region where the south-east trade wind blows most regularly. In the Indian ocean the region between 15° and 20° S. has more than 2000 mm. (80 inches) of rain, which Dr. Supan explains by a wider extension of the north-west monsoon here. This can hardly be the case, as the wind map of the *Deutsche Seewarte Atlas* of the Indian ocean says of this region, "Stetiger Passat, Januar mässig, Juli frisch," which explains the heavy precipitation in the east of Madagascar, but not the continuation of it nearly as far east as 120° E.

Comparing the continental and ocean rainfall, it is seen that the latter is greater than the former in high latitudes, but lower in the trade wind regions outside the equatorial rain belt, for only here the summer breaks the rule of the normal trade winds.†

Dr. Supan has also prepared the first seasonal precipitation maps of the world. They are a welcome addition to our knowledge. The winter characteristics are drought, with rain round a fringe of coast where westerly storm winds blow or steady trade winds are deflected upwards. The Mediterranean is rainy at this season, but Dr. Supan is probably wrong in showing a precipitation of over 60 mm. over the Iranian plateau, for two years' records at Ispahan give a mean of only 5 mm., at Meshed (three to six years) 41 mm., and at Kabul (three years) 40 mm.

In summer the rain is maximum at most inland places, and the dry areas are either in very high latitudes where the temperature is low, or in the trade-wind regions. The effect of the movement of the trade-wind belts on the positions of the

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* "Die Verteilung des Niederschlags auf der festen Erdoberflache," von Alexander Supan. *Petermann's Mitteilungen*, Engäzungsheft, Nr. 124 (Gotha: Perthes, 1898), pp. iv., 103. Three plates of maps. Price 7M. 40Pf. "Die jahrlichen Niederschlagsmengen auf den Meeren." *Petermann's Mitteilungen*, Nr. 44, pp. 179–182. One plate. Gotha: Perthes, 1898.

† The writer will deal with the mean annual rainfall over the land in discussing his own map, shown and described at a meeting of the Scottish Meteorological Society, before Dr. Supan's map was published. (This will shortly be published by the Royal Geographical Society.)

upwelling cold areas of the oceans and on the rainfall of the west sides of the continents is noticeable. In low latitudes in the Atlantic we find dry summers between 40°–27° N. and 35°–30° S., persistent drought between 27°–19° N. and 30°–17° S., dry winters between 19°–7° N. and 17° S.–1° N., and persistent rains between 7°-1° N. In Western Australia there is no coastal region of persistent drought, in western North America the winter drought area does not occur, and is very slightly developed in South America, whereas the persistent drought area of the latter stretches from 30°–4° S., corresponding to the great extension of cold coastal waters.

Autumn is rainier than spring, as the effect of the summer heat is still felt in autumn, while the cold of winter still affects the spring. Owing to the changes from month to month being much greater in spring and autumn than in winter and summer, a map of spring and autumn rainfall is not so accurate a picture of the conditions in any one of the three months making it up as one of the other two seasons.

Dr. Supan's general conclusion as to the seasonal distribution of rain may be summarized as follows:—

1. If we consider the mean precipitation of the zone between any two parallels, the maximum occurs in summer, and autumn is rainier than spring.

2. With the exception of the sub-tropical dry areas, the rainfall is not only greatest, but also most evenly distributed, at the time of the sun's highest noon position.

3. Winter and summer rains have different origins, and the evaporation of continental waters is an important factor in the latter, and condensation conditions are also more favourable. Hence—

4. The diminution of the rainfall means from the coast to the interior is much greater in the case of the year than in the normal conditions of summer.

An analysis follows of the value of the factors in different parts of the world at different seasons in the equation—

$$R = (L + M)K$$

where R is the rainfall, and L and M denote water-vapour of land and marine origin respectively, and K is a constant. It is well, however, to insist on the fact that practically all water-vapour is ultimately of marine origin, which is rather lost sight of in this analysis.

A useful little inset map shows the distribution of regions where rain falls at all seasons of the year, and also where it hardly ever falls.

The most original part of the paper is the map of rainy seasons and mean annual range of rainfall determining different degrees of periodicity. Winter and summer rains are distinguished according as most rain falls in one or the other half of the year. The range is obtained by subtracting the minimum monthly rainfall from the maximum, and calculating the percentage this difference forms of the mean annual precipitation. In a number of cases the maximum monthly rainfall does not occur in the rainy half of the year, as, for instance, at Colombo or Besançon or London, or in a number of stations in Central England. In using the map, it is necessary to distinguish clearly between the two things shown on it, and not to interpret the colour shades as indicating the proportional excess of the precipitation in one half of the year. It would have been better had Dr. Supan used two maps, or adopted a different scheme of representation on the one. Apart from these criticisms, the map is a most useful and interesting one. In middle and high latitudes winter rains occur on islands and round the coasts only, reaching nearer the equator, as well as further inland, on the west

than on the east, and also extending over the oceans. Winter rains also fall on the east side of the intertropical lands, subjected to the trade winds. A third type of winter rain is found in the higher elevations of regions where summer rains are most plentiful on the low grounds; for instance, in the highlands and uplands of Central Europe. There is thus a height at which winter and summer rainfall is equal. This Dr. Supan terms the inversion level (*Umkehrungsniveau*), and he shows that this is lower the smaller the range of rainfall. The greatest of these islands of winter rain lies south of the Ohio, between 97° W. and the Atlantic, excluding Florida and the coasts of Georgia and South Carolina. The height of this inversion level increases with the distance from the sea. A double inversion level may occur if the land rises high enough and is not too far from the sea, as in the Western Ardennes.

Dr. Supan draws a line, the hydrometeoric equator, dividing regions experiencing the rainfall conditions of the northern winter half-year from regions which have those of the southern summer half-year, and *vice versâ*. This bends south of the astronomical equator in the east, and north in the west, of the continents, which may be interpreted, in the present writer's opinion, as a monsoonal phenomenon.

The percentage ranges of rainfall are divided into four groups: under 10, 10 to 20, 20 to 30, and over 30 percentage of the annual total. (1) When the mean range is under 10 per cent., rain may fall at all periods of the year, but such regions are characterized by irregularities in the rainy periods from year to year. A large portion of Europe lies in this region, and the whole area may be defined as that of cyclonic storms. (2) The region of moderate periodicity, 10–20 per cent. range, possesses months in which only maximum or only minimum values are registered in a series of years, and never both. The rain-curve of the year is flatter than in (3), the region of strong periodicity, over 20 per cent., where from year to year rainy and dry seasons are sharply and consistently divided from each other. This is characteristic of tropical and sub-tropical lands.

Means for Labrador longer than Dr. Supan's confirm his supposition that this region is one of prevalent summer rains; but the present short-period figures for Ispahan, Kabul, and Meshed point to a greater periodicity in these regions than Dr. Supan has shown.

The amount of annual rainfall varies inversely as the range, other conditions being the same, except in monsoon lands and in sub-tropical lands with a summer minimum, in both which cases the range depends on the maximum.

It is surprising to find a geographer like Dr. Supan, with all the resources of a great cartographical establishment at his disposal, using a Mercator projection for his rainfall maps. The colour scheme, too, could be improved. A dull brown comes disconcertingly between greens and blues. If it was necessary to use this at all, it should surely have been employed for the lowest rainfall. In other respects the work is excellently reproduced.

Finally, it would have added still further to the value of the map had a distinction been made between regions with rainfalls over 2000 mm., and had the 1500-mm. line been drawn.

Dr. Supan's work makes a great addition to our knowledge of the distribution of rainfall, furnishes a collection of valuable data expressed in the same unit for all extra-European lands, and is full of suggestions and explanations, which, while not always final, help us to state the conditions of the problems to be solved more satisfactorily, and are stages on the way to correct solutions. Dr. Supan has produced a classical monograph on rainfall.

THE MONTHLY RECORD.

EUROPE.

A National Park for Germany.—We learn from *Globus* (vol. 74, No. 20) that a scheme which has been set on foot for the formation of a national park for Germany after the model of those in the United States is likely to meet with success, having already been brought under discussion by the Prussian Ministry of Agriculture. The chief merit for the agitation of the idea is said to rest with Herr Wetekamp, who early in 1898 pointed out the necessity of measures for the preservation of the indigenous flora and fauna, in view of the constant encroachment of cultivated plants and domestic animals. This could only be done by the setting apart of districts which have so far retained their natural characteristics, and protecting them from modifying influences. In order that the various natural types of surface might be preserved, it would be necessary to reserve not merely forest regions, but areas of bog, heath, etc.; and Herr Wetekamp is of opinion that, although in Germany they must be content to work on a more modest scale than in America, the results aimed at might be attained by the reservation of areas of a few square kilometres in various parts of the empire.

ASIA.

Captain Deasy in Central Asia.—Captain Deasy writes from Yarkand, under date October 22, 1898, briefly announcing the results of his recent summer journey, fuller details of which he promises by the next mail. He had made an attempt to find a direct route into Northern Tibet across the Kwen Lun, west of the part explored by Roborovsky, but had been foiled by the complete absence of vegetation and the existence of a very high range of snowy mountains, the south side of which he had surveyed in 1896. He had also been hampered by bad weather and illness, as well as by the obstructions put in his way by the Amban of Keria, who refused to allow him to travel *viâ* Polu to the Aksai Chin. He speaks, however, of having discovered the sources of the Khotan Daria in lat. 35° 35′ and approximately long. 81° 40′ E. This would place them considerably to the south-east of the position usually assigned to them, and would bring them very near the upper basin of the Keria-daria, as shown in our maps ever since the survey of the Pundit attached to the Forsyth mission, so that further details respecting this part of the journey will prove of interest. Captain Deasy expected to make a trip to the Pamirs, and to return in the spring to the Aksai Chin and Khotan-daria.

Mr. Cobbold's Journey in Central Asia.—A somewhat extensive journey has lately been made by Mr. R. P. Cobbold, late 60th Rifles, through Turkestan and the Pamirs, but, owing to the large number of travellers who have visited those regions within recent years, comparatively few additions to our geographical knowledge can be expected to result from it. Mr. Cobbold set out on his journey in company with Captain Deasy (in September, 1897), but on reaching the Pamirs the travellers separated, Mr. Cobbold making his way to Kashgar by the Gez defile. From Kashgar he crossed the Tian Shan range by the Turgat (Tur Agat) and Tash Rabat passes and Lake Chatir Kul, to the Naryn valley, and finally to Lake Issyk Kul. In this section of his route, he was, we believe, on ground not previously visited by an Englishman, though known from the explorations of Russian and other travellers. At Akbashi he experienced a temperature of 27° Fahr. below zero. The Tian Shan country reminded him much of Kashmir, the hills being covered with pine forests. After visiting Viernoe, and attempting to penetrate the Ala-tau range, he made his way to Lake Balkash, following the course of the Ili. The

temperature at the lake fell to 36° Fahr. below zero. Returning to Viernoe and recrossing the Tian Shan, of the mineral wealth of which he speaks enthusiastically, he again reached the Pamirs by the Gez defile, the Alai being reported as blocked by snow. He had hoped to cross the Pamirs from east to west, but on arriving at Kala-i-Wamar, on the Oxus, by way of Kara-kul, Tashkurgan, and the Bartang defile, he was arrested as a spy and taken to Shignan, where there is a Russian fort about 2 miles from the Afghan post at Kala Bar Panj. Thence he was sent back to Chinese territory, which he reached by the Kara-art pass (July 1). Passing round the base of Mustagh-ata, he reached Tashkurgan, in Sarikol, and recrossed the Hindu Kush into Gilgit, arriving there on August 4. Besides making botanical collections, Mr. Cobbold took a considerable number of photographs, and also brought back some volumes of ancient manuscripts. He does not appear to have made any survey, but thinks he will be able to correct some inaccuracies in the maps of the country between the Kara-kul and the Oxus.

Prof. J. Walther on the Oxus Problem.—Although the once accepted idea that the Oxus formerly flowed to the Caspian has of late years lost ground, many writers have thought that in times of exceptional flood some water may have found its way into the Uzboi (and thence into the Caspian) by way of the Sarikamish depression. The latest writer on the subject, Prof. J. Walther (*Petermanns Mitteilungen*, 1898, No. 9), who has studied the whole question with much care on the spot, entirely disbelieves in any such former connection, and his discussion of the subject, based chiefly on physical-geographical and geological grounds, is perhaps the most scientific that has yet appeared. At the outset, he explains Anthony Jenkinson's statement as to the former flow of the Oxus, by showing that he evidently confused Lake Aral with the Caspian; his statement that the water was fresh is in itself sufficient proof, and his account of a change in the course of the river must have referred to a branch of the delta only, the natural tendency of the stream to shift to the east having been perhaps reinforced by human agency. Prof. Walther considers that ancient literature, when properly understood, supplies no proof that the Oxus ever flowed to the Caspian, for Abulghazi has been shown by Kiepert to be untrustworthy. Coming to the geological side of the question, he shows that the mud characteristic of the Oxus deposits is of a dark grey colour, while a careful examination of the bed of the river at Charjui by means of borings has proved that for centuries the stream must have carried the same mud as at the present day. Yet such mud is entirely wanting in the neighbourhood of Usun-Ada, where alone on topographical grounds the supposed mouth could have been. The levelling which has been carried out along the Uzboi shows that there is no regular slope of the ground, but that there are hollows separated by sections at higher altitudes. Again, the channels are not continuous, but suddenly cease and give place to stretches of unbroken desert. Prof. Walther therefore attributes them solely to the action of the desert climate, showing how wadis may be started by a sudden torrential downpour, and afterwards excavated further by the action of winds, etc. Konshin's idea that the channels might have been excavated by the retiring Aralo-Caspian sea of former times is, he shows, untenable, because the retrogression of the waters would be gradual, being due simply to the excess of evaporation over water-supply.

Count Zichy's Journey in Mongolia.—Count Zichy writes to *Globus* (vol. 74, No. 20), under date September 10, 1898, giving some account of the manners and customs of the people of Urga, in Mongolia, which place we had reached by way of the Buriat country and Kiachta. It will be remembered that the primary object of the journey is the elucidation of the early history of the Magyars, but the letter contains no information on this subject. Among the Buriats Count Zichy

had principally devoted himself to the study of the Shamans. At Urga he had mixed with the Mongols and learnt much of their habits. He remarks on their religious fanaticism, and sends photographs (taken by the lamas, as strangers may not enter the presence) of the Bogdo Gegen, or supposed incantation of the Deity, to whom the place owes its sacred character. A large number of meteorological observations had been taken during the journey, whilst many photographs of inscriptions, tombstones, etc., had been secured, and good collections had been made by the zoologist of the party. At Urga the travellers found the daily variations of temperature very trying; between 5 a.m. and midday, the thermometer would rise from 30° to 107° Fahr. Count Zichy was about to cross the desert to Kalgan, and hoped to reach Peking early in October. His letter took little over a month to reach Germany from Urga.

A Trip through Hunan.—Mr. M. O'Sullivan has recently written an interesting report on a trip to the province of Hunan, in mid-China, which he made last winter and spring, at the instance of the Shanghai Chamber of Commerce. He started from Hankau in a large houseboat on December 14 last. About 460 *li* above is the junction of the Nan-ho with the Yang-tse, the former being called the Ta-ho, or "great" river, and the latter the Shao-ho, or "small" river, a matter of surprise to the traveller, though later on he came to the conclusion that the more important designation was warranted by the depth and volume of the Nan-ho. The point, however, is one of some interest and geographical importance, and can hardly be said to be as yet definitely ascertained. The traffic on the Hunan waters, like that on most of the Chinese rivers, is enormous, and crafts of all sorts and rafts are seldom out of sight. Mr. O'Sullivan's river survey work began at Yo-chau, his first halting-place, and the gate of Hunan, where the river narrows down to about 400 yards across. From thence a running survey was made of the channels across the Tung-ting lake for a distance of 200 *li* (2·78 *li* make a mile) as far as Lenlingtan. Twenty-eight *li* beyond Lenlingtan is the town of Lintzakon, which, though small, is an important place, as all the trade carried on between Central Hunan, Western Hunan, and Kwei-chau passes through a canal which branches off to the west at this place. Changsha, the provincial capital, is a very important city and distributing centre. Two islands occupy mid-stream, while to the west rise hills well wooded and suggestive of a cool retreat, when the blazing sun of the 28 N. latitude makes the busy city beneath too hot for comfort. Situated some 90 *li* above the provincial capital is Siangtan, once the first commercial centre in the province, and even now boasting a population well over 500,000. It was formerly the centre of the banking and mercantile exchange, but of late years the tendency has been to concentrate this class of business in Hankau. The tea business has also declined here as elsewhere. Heng-chau-fu, 560 *li* above Changsha, is another distributing mart, and from hence the interior is reached by small native cargo boats, which ply on the waterways which intersect these parts for over 200 miles. This forms the terminus of the Siang, as far as navigation by small steamers is concerned, but there are three dangerous barriers of rocks, which should be removed before steamers attempt to reach so high a point when the waters are low, and a few shallow crossings which should be dredged. When this is done, 300 miles will have been added to the navigation of the Yang-tse between Hankau and Ichang. Changte-fu, the capital of Western Hunan, vies with Changsha in size and importance, and runs a close second as to trade. The population of 200,000 is mixed, including a colony of over 4000 Mohammedan families, who live in the eastern part of the city, and are devoted and even warlike followers of the Prophet. They own three mosques. Mr. O'Sullivan was not a little surprised at the number and variety of European

goods for sale in the markets of Changte-fu; he gives a useful list of these, as well as of those of Japanese manufacture. The market for all these goods at Changsha, the provincial capital, is not so good as that at Changte-fu, and the Chinese appear to be more accustomed and well disposed to foreigners at the latter place. The vast majority of the population earn a livelihood on or by the water, the women performing much of the agricultural work. When the rice is gathered in, one year's supply is put aside, and the remainder, if any, is sold, a large quantity going to Hupeh, which is said to be dependent on Hunan for rice. The hills, however unproductive when viewed from the standpoint of the husbandman, yield large quantities of coal, iron, antimony, copper, lead, and zinc. The area of the coalfields of Hunan is said to be more than that of all Europe, the best quality being obtained from Ping-shan-hsien, on the borders of Kiang-si, whither a qualified Chinese mining engineer has been despatched by H.E. Sheng, from Shanghai. Hunan, Mr. O'Sullivan remarks, has been the hot-bed of conservatism and anti-foreign feeling, and it was only at the point of the bayonet, so to speak, that telegraph-poles were allowed to be erected. At the present day three places, and no more, viz. Yo-chau, Changsha and Siangtan, are connected with the network of wires, efforts to extend them elsewhere having been forcibly resisted by the people. As a set-off against this, it should be stated that the present governor has installed electric lights at the Yamen, and at the beginning of 1898 over a hundred shops in the vicinity of the Yamen were lighted by electricity. Two steam despatch boats have been procured by him, and he has also established the Shi Wu College for the study of the English language. Many of the young *literati* are learning English and making good progress, and a Medical School is to be established at Changsha, a further earnest of the development of this important part of the Yang-tse basin. Mr. O'Sullivan has since paid a second visit to Hunan, on a mission connected with the establishment of a Mines Department for the province. His reception on that occasion, in May last, at the hands of the authorities and the people, was very friendly, and a strong desire was expressed by some of the more enlightened officials that means should be taken by the British Government to organize an official mission to the Changsha, and open up communication with the principal towns. The same recommendation is made by Mr. F. S. A. Bourne in his Foreign Office Report issued last spring.

The Mountain Dwellers of Formosa.—In the tenth number of *Petermanns Mitteilungen* for 1898, some account is given of Formosa and its mountain-dwellers, by R. Schumacher, who bases his remarks on his own observations during a visit to those people. He gives special attention to the origin of the Formosan mountaineers, about whom very little has been known until quite recent years. The opinion has often been expressed that they belong to various races, but this is doubted by Herr Schumacher, who brings forward arguments for supposing them Chinese by race. He concludes, from the well-thought-out principles displayed in the form of their settlements (examples of which are to be found both in India and China), that they are not the primitive population of the island; and although the fact (of which he was assured both by Chinese and Japanese) that they are Brahmans, might point in the direction of India as their original home, he recalls the fact that before the introduction of Buddhism the Chinese were in part Brahmans. The differences now to be observed between the mountaineers and the Chinese he attributes to the long isolation of the former, but of positive evidence for a former connection he gives but little, his principal points being the similarity of many of the instruments seen in the Formosan mountains, with those once in use among the Chinese, while he draws a comparison between the isolated family life of the

latter and the state of feud prevalent among the mountaineers. In his general notes on the island, Herr Schumacher discusses the question of the unhealthiness of the island, holding that it arises in part from preventible causes, particularly the bad situations chosen for the settlements. The introduction of rice cultivation has, he thinks, exercised a deleterious influence. With regard to the orography, he calls attention to the fact that there are in the east of the island two parallel chains with a wide fertile plain between them, whilst a curious point noted is the almost universal black colour of the domestic animals.

AFRICA.

Scientific Expedition to Central Africa.—A committee has been formed, consisting of Sir John Kirk, Dr. P. L. Sclater, Mr. Thiselton-Dyer, Prof. Lankester, and Mr. G. A. Boulenger, for the purpose of organizing a new expedition for the examination of the fauna of the African lakes. The interesting results of Mr. Moore's expedition to Tanganyika, already noticed in the *Journal* (vol. xii. p. 313), justify the anticipation that still more valuable additions to our knowledge of the geological history of the continent would ensue from the more complete investigation of the lake fauna, especially in the part of the great central depression north of Tanganyika. Mr. Moore has already shown that the remarkable fauna of marine affinities discovered in that lake does not exist in Nyasa or in any of the lakes which have so far been examined from this point of view. It may, however, be found in Lake Kivu, and in the Albert Edward and Albert lakes, and this is the more probable, as some resemblance has been noticed between the organisms of Tanganyika and those of the Nile. The proposed expedition will again be placed under Mr. Moore's leadership, and the idea is for him to proceed first to Lake Tanganyika, making his way northwards thence to Lakes Kivu and Albert Edward, and afterwards striking eastwards and returning to the coast through Uganda and British East Africa. A sum of not less than £5000 (a part of which, including a contribution by the Society, has been already promised) will be required for this purpose, and the committee appeal for help to those interested in the objects of the expedition. Although much has been done both by the Belgians and Germans to explore the country north of Tanganyika, there is no doubt that useful geographical results would also be gained from the undertaking.

Dr. Cureau's Surveys on the Nile-Congo Watershed.—Some extracts from a recently published report of Dr. Cureau, who about a year ago was commissioned to survey astronomically the route followed by M. Liotard and his officers between the Mbomu and Dem Ziber, in the old Egyptian Bahr-el-Ghazal province, are published in the *Politique Coloniale* for December 6 and 7 last. They contain some instructive remarks on the general nature of the country in those parts. Dr. Cureau describes minutely the methods employed by him in his surveys, which seem to have been executed with much care. Special attention was paid to the fixing of the position of Dem Ziber, the latitude of which was obtained by four series of circum-meridian observations, two north and two south; the longitude by the observation of four occultations and twelve equal altitudes of the moon and of a star. Barometrical observations were taken daily for the determination of altitudes, and though an aneroid only was employed, the results were verified by comparison with a Fortin barometer on the return to Zemio. Dr. Cureau extended his surveys to Jebel Mangayat, an irregular group of heights in the neighbourhood of Dem Ziber. The whole route from Zemio to the Mangayat crossed seven fluvial basins, four belonging to the system of the Mbomu, and three to that of the Bahr-el-Arab. The line of separation between the two versants was quite indistinguishable to the eye, and its position could only be ascertained by the accounts of the

natives respecting the courses of the streams. The barometrical observations disclosed the existence of a slightly raised sill with an elevation of 600 feet above the Mbomu, or 2500 feet above the sea. It is a striking fact that this altitude hardly exceeds that of the plateaux of Mayombe, only three days from the coast. Dr. Cureau draws a sharp contrast between the country on the Nile side of the water-parting and that towards the Mbomu. Granitic formations are much more extensive in the former than in the latter, and the effect of this is seen in the colour of the soil, which is much lighter in the Nile than in the Congo basin. The crystalline group of Mangayat is likened to a handful of big stones flung into a marsh. It consists of a number of isolated masses, the largest a little over half a mile in length, and 700 feet above the plain. The layer of humus is much thicker towards the Mbomu than in the Nile basin; it helps to retain the water which falls during the rainy season, especially at the lower levels. Towards the north, on the contrary, all the streams are periodical, and the country is an immense marsh or an arid plain according to the season. Attempts at cultivation in these parts have met with slight success, and both in its flora and fauna the northern slope of the country approaches in character that of the desert regions to the north. After the annual grass-burnings the surface presents a mournful and monotonous appearance, parched by the fierce rays of the sun.

The Belgians on the Upper Nile.—Since the occupation of Rejaf on the upper Nile by the Belgians under Captain Chaltin (*Journal*, vol. x. p. 213), a good deal of fighting seems to have taken place between the garrison and the dervishes of those parts. In June last a determined attempt to surprise the place was made by the latter, who were only repulsed after severe fighting, in which MM. Desneux and Bartholi were killed, and the commandant, M. Hanolet (known for his explorations on the northern limit of the Congo basin), and several of his officers, wounded. Rumours have since reached Europe that the dervish position at Bor, on the Nile north of Lado, has been taken by the Belgian troops. Although this place is outside the limits of the territory leased by the Congo State, it is pointed out by the *Mouvement Géographique* (1891, No. 48) that the position had long been a menace to Rejaf, and that it would be perfectly allowable for the State troops to clear out a dangerous enemy from their neighbourhood. Should the report prove true, an obstacle will have been removed from the path of Major Martyr who, with the Uganda troops, is advancing down the Nile from Unyoro. The Belgians are stated to have a garrison of 1000 men at Rejaf and 300 at Lado. In connection with the history of the Belgian advance on the Nile, reference may be made to a paper by Lieut. Dubreucq, in the *Bulletin* of the Antwerp Geographical Society (1898, part 2) which describes the operations of Captain Chaltin in 1896–97 on the upper Welle. Besides giving details of the fighting by which the Zande power in that region was broken, it contains some useful information respecting the organization of the Welle district under the Belgian rule.

Visit of Captain Johannes to Lake Manyara.—The second number of the *Mitteilungen aus den Deutschen Schutzgebieten* for 1898 contains a short note by Captain Johannes on the geography of the neighbourhood of Lake Manyara, in German East Africa. Lieut. Glauning had reported in 1896 that the lake had, at the time of his visit, completely dried up, with the exception of a narrow strip of swamp at its south-west side. Captain Johannes believes that in this report a confusion had been made between the small Laua ya Sereri, east of Umbugwe, and Laua ya Mueri, or Manyara. The latter he found, both in February, 1896, and July, 1897, to be an extensive lake, as shown on Baumann's map, and he was told by the Wambugwe that even in the driest seasons it maintains its usual area. The cauldron-like depression of Ngorongoro, north-west of

Manyara, proved, when visited in 1897, to have an oval shape without the north-easterly extension shown by Baumann. An accompanying sketch-map also shows a small crater-lake, north-east of Manyara, discovered by Captain Johannes in 1895.

Completion of M. Wauters' Map of the Congo State.—With the publication of Sheet X., in the *Mouvement Geographique* for November 27 last, M. Wauters' useful map of the Congo State on the scale of 1 : 2,000,000 is now complete. The present issue includes the region of the southern Congo watershed between 21° and 32° E., and, like all the previous sheets of the map, gives the results of a careful collation of all available material. The astronomical observations which supply the basis of the map are chiefly those of Capello and Ivens, Le Marinel and Francqui; but Cameron's position for Lake Dilolo has been accepted, as it fits in with the geography of the surrounding region better than that of the German travellers, which place it further east. By a curious slip, the "Pombeiros" are quoted as the authority for the astronomically fixed position of Kalala Kazembe. The chief novelty in the map is the delineation of the basin of the Lubudi, the western branch of the Kamolondo or Western Lualaba, which, however, is largely hypothetical. In accordance with his dictum that the true upper Congo (the *branche mère* of the river) is that which flows at the bottom of the central depression,* M. Wauters gives this title to the Lubudi, which he shows as flowing in a great valley enclosed between chains of mountains running from south-west to north-east. He continues this valley to the vicinity of Mount Kaomba, at the source of the Zambezi, and is therefore obliged to suppose two branches of the Lubudi, to the more easterly of which (crossed by Capello and Ivens in 12½° S.) he gives the name Lububuri used by the Pombeiros. There seems no good ground, however, for considering the Pombeiros' name more than a variant of the other, the intermediate form Luburi being also used. M. Wauters also shows a narrow gorge at the passage of the Lububuri through the chain of the Mitumba mountains, basing this feature on the analogy of the gorges of the Nzilo and Lufira; but it may be remarked that such a gorge is not mentioned by Arnot, who crossed the river almost in the latitude in question. Higher up M. Wauters supposes the river to drain a wide circular basin surrounded by higher ground.

River Names in the Congo Basin.—With regard to the spelling of river names in the southern parts of the Congo basin, Lieut. Cerckel writes to the *Mouvement Géographique* (1898, No. 42), pointing out that the syllable *Lu*, which appears in so many of the names as usually written, is not part of the name proper, but is merely a general designation for river, being a shortened form of Lui. Lu Mami (river Mami) is thus the correct form in place of Lomami. The syllable can be placed either before or after the name, thus Sanku Lu (not Sankuru) means "river Sanku," while the full form is also used, as in Chibu Lui. The variations are probably introduced for the sake of euphony, and different forms are used by different tribes; the Baluba, *e.g.*, use the form Lu Bu. For quite small streams, Lu is replaced by Ka, which has generally a diminutive force.

Captain Ramsay's Journey from Tanganyika to the Coast by Lake Rukwa.—Captain Ramsay, the active explorer of the less-known parts of German East Africa, read a paper on his latest journeys before the Berlin Geographical Society in June last (*Verhandlungen*, 1898, No. 7). His expedition to Ruanda,

* M. Wauters states that the *most remote* source of the Congo would be the easternmost headstream of the Malagarazi, whereas this must be at least 400 miles less remote than the source of the Chambezi.

which formed the subject of the first part of the paper, has already been described in the *Journal* (vol. xi. p. 299), so that it will be sufficient now to refer to the second part, which relates to his journey to the coast, in November and December, 1897, through the more southern parts of German East Africa. Crossing the Malagarazi, Captain Ramsay proceeded southward through Tongwe and Kawende, keeping as near the shores of Tanganyika as possible, in order to survey them. This land route had not for many years been followed by a European. The bordering range, which is very high and falls steeply to the lake, made an imposing appearance, and in order to pass some of the rocky headlands, it was necessary to make wide circuits inland. The country presented a great contrast to the more northern districts, from its scanty population and small area of cultivation; the separate villages are at constant feud with each other. In Fipa and Urungu both the White Fathers and the African Lakes Company exercise much influence, and Captain Ramsay especially praises the good work of the former. Many of the porters employed on the caravan route between Nyasa and Tanganyika are recruited from the German sphere, and as they are paid in cloth, the inhabitants were found to be much more clothed than in the more northern districts. The lake was left at Kirando, and after a steep ascent of many hundred feet, the wide Fipa plateau, bare of trees, but well watered and fertile, was crossed. The whole of Fipa is subject to King Kapere, or Kapufi, belonging to the ruling race, of Mtussi type, which in Captain Ramsay's opinion must have immigrated from the north many years ago. The country is less peopled than formerly, owing to the slave-raids of the coast people, who even now have large settlements in Fipa. A steep descent of almost 5000 feet led to the Rukwa plain, where the traveller finds himself in an entirely different world. Above, the thermometer fell to 43° Fahr., while below, a heat of 111° was experienced, recalling the Red Sea in July and August. Giant baobabs, tamarinds, and woods of acacias also made their appearance. The former bed of the lake was at the time a wide sandy plain, devoid of vegetation, but it becomes swampy in the rains. Frequent dust-storms, with darkness as of night, were experienced, and to these Captain Ramsay is inclined to attribute the scarcity of game. He is at a loss to explain the sudden decrease in the area of the lake, but throws out as a suggestion a possible connection with the fall of Lake Tanganyika. The level of Rukwa is, he thinks, a trifle higher than that of the larger lake. He thinks the open water at the south end does not extend for more than 60 statute miles, with a breadth of 12 to 18 miles, and considers Mr. Wallace's estimate exaggerated, apparently through confusing English with German geographical miles. The journey was continued round the south end of the lake, and through Urori, Ubena, Uhehe, etc., to Dar-es-Salaam.

Lake Bangweolo.—Commenting on the map of Lake Bangweolo published in the *Journal* in illustration of Mr. Weatherley's surveys, H. Singer (*Petermann's Mitteilungen*, 1898, No. 11) expresses a doubt whether the delineation of the southern half of the lake as a mere swamp should be accepted as correct. But while allowing with him that the mapping in question cannot yet be considered final, we may point out one or two inaccuracies into which the writer has fallen. Like Mr. Crawford (*Journal*, vol. xi. p. 180), he seems to imagine that Giraud showed the southern parts of the lake as open water, whereas the reverse is the case. The French traveller, like Mr. Weatherley, gives Kawende point as the place of exit of the Luapula, having found the whole region east of this, in which he searched for the mouth of the Chambezi, blocked by an impenetrable wall of reeds. In summing up the results of his survey, he says that he found but 20 miles of open water in place of the 90 shown by Livingstone. Herr Singer is in error again in saying that Giraud applied the name Bemba to the southern basin in distinction from

the northern (Bangweolo). The names were so applied by Capello and Ivens, who, however, did not visit the lake, but obtained their information from the natives at some distance from it; and even they allow that the southern portion has rather the character of a swamp than of a true lake. A small extent of open water (*une petite nappe d'eau libre*) was indeed found by Giraud during his passage through the swamps, and this is the Kampolombo bay of Mr. Crawford, which is shown as a quasi-independent lakelet in M. Wauters' recent map of the southern Congo basin.

The Coal District North-West of Lake Nyasa.—The *Deutsches Kolonialblatt* for November 1 last contains a short account of a visit by Herr Zenke to the coal-bearing district north-west of Lake Nyasa. The coal deposits were, as has been already mentioned in the *Journal*, discovered in 1896 by mining engineer Bornhardt, the results of whose surveys are shown in a map given with the *Mitteilungen aus den Deutschen Schutzgebieten* (1898, pt. 2). They occur on the eastern slope of the ridge which runs between the Songwe and Kivira rivers, and is drained by tributaries of both streams. The object of Herr Zenke's journey was to endeavour to bring a supply of coal down the Kivira to Lake Nyasa. For this purpose he obtained the services of 116 porters, who, owing to the nearness of the deposits to the surface, were able in a single day to deliver their loads at Maisura's on the Kivira, from which point they were transported in canoes. The total weight of coal amounted to 45 cwt. Herr Zenke thinks that with porters engaged under a permanent agreement the coal could be brought to the mouth of the river at a cost of 22½ rupees per ton, but he is doubtful whether the enterprise would pay at this rate. He also visited the extremely fertile and well-peopled district of Bundali, which he considers well suited for the cultivation of coffee and also of European cereals. A striking point in the geography of the region is well shown on the map of Herr Bornhardt's surveys, from which it appears that the Songwe and Kivira approach within half a mile of each other 20 miles from their mouths, being only separated by a narrow ridge of high ground.

The Origin of African Culture.—A young German ethnologist, Dr. L. Frobenius, has made a special study of the various forms of culture observable in Africa, with a view to the determination of their place of origin. He has lately brought out a book embodying the results of his researches, having previously set forth his ideas on certain aspects of the question both in *Petermanns Mitteilungen* (1897, Nos. 10 and 11; 1898, No. 9) and in the *Zeitschrift* of the Berlin Geographical Society (1898, No. 2). In the latter paper he explains his method of investigation, which he says consists of two parts bearing a relation to each other parallel to that subsisting between anatomy and physiology. Under the first head he examines the different objects—drums, bows, shields, musical instruments, etc.—associated with different forms of culture, noting the material employed and the connection between its distribution and that of the object in question. Under the second head he discusses the forms of culture as influenced by such factors as the nature of the habitat, endeavouring to trace the routes by which the different forms have made their way into Africa from neighbouring regions. The general result is to distinguish four forms of culture, the distribution of which is shown on a series of maps, viz. the Nigritic, Malayo-Nigritic, Indo-Nigritic, and Semito-Nigritic, the names being applied as indicative of their supposed origins. The author devotes special attention to the second of these, which forms the subject of the articles in *Petermanns Mitteilungen*. He seeks to show that a well-defined region in West Africa (Congo basin and shores of the Gulf of Guinea) is marked by a form of culture which in its component parts shows a decided affinity to that of Western Oceania (Melanesia, etc.). Herr Frobenius's speculations are certainly

ingenious, but are hardly likely to be accepted without a more thorough investigation than has yet been given to the subject.

Captain Wellby's Expedition to Abyssinia.—We are informed by Mr. J. H. Wellby that his son, Captain Wellby, well known for his journey across Northern Tibet, has reached Addis Abeba, *en route* for the Galla countries and Lake Rudolf. In an interview with King Menelik he has obtained permission from that monarch to travel wherever he may wish, as well as the promise of a safe conduct on his way down the Omo to Lake Rudolf, and letters to all the chiefs through whose territory he may pass. On arriving at Lake Rudolf, Captain Wellby hopes to strike westwards to one of the sources of the Sobat, and descend that river to the Nile.

AMERICA.

Sir Martin Conway in the Andes.—Sir Martin Conway continues his ascents in the Andes with untiring energy. Telegraphing to the *Daily Chronicle* on December 10, he announced his successful ascent of Aconcagua on the 7th of that month, having taken only four days to make his way from Banos del Inca to the summit. Writing to the Society from Bolivia, Sir Martin states that he hoped to visit Tierra del Fuego and climb Mount Sarmiento. He has sent home very considerable collections, and also various maps, partly the result of his own surveys. He expects to reach England in February.

AUSTRALASIA AND OCEANIC ISLANDS.

South Australian Tablelands.—Two reports, by Messrs. D. Lindsay and C. Winnecke, on the tablelands of the northern territory of South Australia have recently been issued. The country known as "The Tableland," described by Mr. Lindsay, lies between latitudes 17° and 21°, and between the overland telegraph line and the Queensland border. It is about 1000 feet above sea-level, and is an undulating country with extensive plains. The more eastern portion is the highest, a low range some 100 feet to 150 feet high being the most conspicuous feature. The water-channels are the Lorne, the Rankine, the James, Buchanan, and Playford rivers, besides numerous creeks. These rivers and creeks empty into large depressions, forming extensive lagoons and lakes. The climate is healthy, while the average rainfall is about 20 inches per annum. The country appears to be well adapted for sheep, as also for cattle and horses. The country explored by Mr. Winnecke extends from lat. 18° 30′ S., long. 134° 30′ E., to lat. 22° S., long. 137° E. and 138° E., a distance in a north-west and south-east direction of nearly 400 miles. To the north-east of this line, the country examined to some distance beyond the Queensland boundary (long. 138° E.) consists of open, magnificently grassed Mitchell grass downs and plains, intersected by numerous large and small watercourses. Near the Queensland border an abundance of water can be obtained at a depth of about 200 feet below the surface. The temperature ranges from 26° Fahr. in June, to 120° in January. The elevation of this country above sea-level on the western parts is about 800 feet, and on the eastern portions, near the Queensland border, lat. 22°, about 450 feet.

POLAR REGIONS.

Supposed New Island in the Spitsbergen Sea.—Mr. Arnold Pike, who a year ago gave the Society an account of his cruise in the seas around Spitsbergen, writes under date November 18, 1898, informing us of a voyage to the same seas made during last summer by his captain, P. Nilssen, of Arendal. During the

voyage Captain Nilssen had hunted round an island (which he named Victoria after the vessel) lying in 80° 8′ N., 37° 17′ E. It is roughly 9 by 5 miles in extent, and 500 feet high. The position assigned would place it some 40 miles to the north-west of the homeward track of the *Windward* in 1897, whilst it would lie about midway between White island (seen by Captain Kjeldsen in 1876 and by Captain Johannesen in 1887) and Franz Josef Land. Mr. Pike throws out the suggestion that the new island may be the long-sought Gilies Land, but it is to be remarked that the altitude of White island (over 2000 feet) agrees much better with the "very high lands" said to have been seen by Gilies, though its distance from North-East Land does not amount to anything like the 25 Dutch miles supposed to separate Gilies land from the latter (Daines Barrington, 'Possibility of approaching the North Pole asserted,' p. 144). The latitude agrees well with that mentioned in the old account. Captain Nilssen saw no floe-ice before reaching White island, but on approaching Franz Josef Land was prevented by ice from landing. He had been in the direction of Greenland earlier in the year, but could not get within 26 miles of Liverpool coast for the same reason.

The Andrée Search Expedition.—News has been received from the Andrée search expedition under Herr Stadling, giving details of its proceedings down to November 29. On September 16 the leader wrote from Balkur, in the Lena delta, saying that the steamer *Lena* had arrived from Yakutsk, seventeen days late, and that Dr. Nilson was about to return to that town by river, while he himself and Herr Froenkel would proceed down the Lena to the sea, and so to the Olenek. Dr. Nilson had obtained rich botanical collections. Herr Stadling makes some observations on the fisheries of the Lena delta, to develop which efforts have of late been made. He thinks that if the contemplated railway from the upper Lena to join the Great Siberian railway became a *fait accompli*, a trade might spring up for the supply of fish to the industrial and mining districts of the south. The latest account, sent from Yeneseisk, reports that in the voyage to the Olenek Herr Stadling and his companion were wrecked, but managed to reach an uninhabited island, 170 miles from the river, where they remained ice-bound seventeen days until succour reached them. Gaining the mainland, they procured reindeer and proceeded to the mouth of the Anabar, and thence *viâ* Khatanga bay and the Taimyr lake region to the Yenesei. No trace of Andrée or his balloon had been discovered.

Mr. Borchgrevinck's Expedition.—A telegram to the Society from Hobart, Tasmania, on December 19, announced the departure southwards of Mr. Borchgrevinck's antarctic expedition, in the *Southern Cross*.

GENERAL.

The Seventh International Geographical Congress.—Circulars of invitation, setting forth the proposed arrangements for the Seventh International Geographical Congress, to be held during 1899 at Berlin, have been issued by the Berlin Geographical Society. The meeting will take place from September 28 to October 4, and both before and after that period excursions will be arranged through such parts of Germany as may be of interest with regard to physical and economic geography. One to Hamburg, in response to an invitation from the Geographical Society of that city, is specially mentioned. The subjects to be discussed at the Congress are divided into eight groups, under the headings (1) Mathematical Geography and kindred subjects, (2) Physical, (3) Biological, (4) Industrial and Commercial Geography, (5) Ethnology, (6) Topical Geography, (7) History of Geography and Cartography, (8) Methodology, Bibliography, etc. It has been decided that no exhibition will be arranged on the part of the Congress, but it is possible that private exhibits will be made. The payment securing

membership is 20 marks (£1 or 25 francs), while ladies accompanying members will be admitted as associates at half that sum. The notification of subjects for discussion or papers offered must be made before April 1, and manuscripts must be sent in not later than June 1. Papers must be written in English, French, German, or Italian. The office of the Congress is at 90, Zimmerstrasse, Berlin, S.W., to which all communications are to be addressed.

OBITUARY.

John Barrow.

By the President.

The father of the Royal Geographical Society, the Fellow who had been at the top of our list since the death of Mr. Ainsworth, has passed away in his 91st year.

John Barrow was born in 1808. He was the second son of that famous Secretary of the Admiralty whose memory is revered by all geographers. Sir John's son was so intimately connected with the work of his father, that we cannot recall the services of the one without dwelling for a moment on the better-known efforts of the other, in the cause of discovery and exploration. Sir John Barrow * was secretary to the Admiralty from 1804 to 1845, a period of forty years, with one brief interval during the administration of "All the Talents." He had previously visited China with Lord Macartney, and had travelled in South Africa and in Iceland. Jointly with Admiral Smyth, Sir John Barrow was the founder of the Royal Geographical Society. The first organizing Committee met in his room at the Admiralty, and he was President of the Society from 1835 to 1837. It is to Sir John Barrow's untiring advocacy that the important work of discovery and exploration became an essential part of the duties of the navy in time of peace. This has been recognized by every administration during more than a century, but never more so than in the days of Barrow at the Admiralty. In the last 120 years, besides enterprises in Africa, the Government has despatched no less than thirty polar expeditions, and has assisted four others with money and stores and by lending officers. The country has cause to lament that there has been no successor to Sir John Barrow at the Admiralty, endowed with the same spirit coupled with the same zeal and energy.

In all this the Secretary of the Admiralty found a most zealous and efficient second in his son. John Barrow became a clerk in the Admiralty as a young man, and in 1833 he was elected a Fellow of the Geographical Society, in the work of which he long took an active part. For some years he was secretary to the Raleigh Geographical Club. His position gave him innumerable opportunities, which he never missed, of helping and furthering the interests of naval officers. His acquaintance among them was very extensive. They all felt a regard for him, and in many this feeling was strengthened into affection and close friendship. For it was impossible to know John Barrow without feeling an affectionate regard for him.

More especially was his attention given to that polar enterprise which was so dear to his illustrious father. He took the deepest interest in the equipment of arctic expeditions, and still more in the welfare of arctic officers and men. Fitz-James, Sherard Osborn, Richards, M'Clintock, were among his closest friends. It is impossible to peruse the letters of Captain Fitz-James to John Barrow, before

* See his obituary in the R.S.G. *Journal*, vol. xix. p. xxxiv.

the departure of the Franklin expedition, without being convinced of the great influence their staunch friend at the Admiralty had among naval officers, and of his desire to use it in furthering their interests. Unostentatious, and deeply rooted in warm friendship and in the memory of many a kindly act, that influence was extensive, and always used for good objects. Every surviving arctic officer will feel that mine is the language of truth.

John Barrow was indefatigable in collecting every scrap of intelligence relating to arctic work, besides printed and manuscript books on the subject. He also had all published polar engravings, and a most valuable gallery of portraits of arctic worthies painted by his friend Mr. Pearse. There is a portrait of John Barrow in Pearse's famous picture of the Arctic Council, which has been engraved.

Latterly John Barrow was keeper of the records at the Admiralty, where he did most valuable service. On his retirement he energetically joined the volunteer movement, and became an enthusiastic alpine climber. He was Lieut.-Colonel of the 5th Volunteer Battalion of the Rifle Brigade. He was an original member of the Hakluyt Society, and edited a volume in 1852, 'Coat's Geography of Hudson's Bay.' He was also the author of a 'Life of Sir Francis Drake' and of 'Elizabethan Naval Worthies.' The results of his alpine work appeared in his 'Expeditions on the Glaciers' and 'Mountain Ascents in Westmoreland and Cumberland.' He also published 'Travels in the North of Europe,' and 'A Voyage to Iceland.'

But it is as the warm and untiring friend of arctic officers that John Barrow will be longest remembered. They presented him with a silver testimonial representing discoveries within the arctic circle on a globe. He died at a good old age on Friday, December 9, 1898. Most of his friends have gone before him. But there are still some left who remember the quiet enthusiasm of the ripe geographer, and cherish in their hearts the memory of the never-varying kindness of their old and tried friend, John Barrow.

Sir George Baden-Powell, K.C.M.G., M.P.

It is with much regret that we record the death of Sir George Baden-Powell, which took place on November 20 last, at the comparatively early age of 51 years. Although he had for some time been in impaired health, it was not until a fortnight before his death that he had been known to be seriously ill, so that the end came as a shock to his wide circle of friends, who had looked forward to many years of public usefulness for him.

Our deceased associate was the son of Prof. Baden-Powell, of Oxford, well known as a mathematician and geologist. At the completion of his school career, which was divided between St. Paul's School and Marlborough College, he spent three years in travel, visiting both India and the Australasian colonies. In 1872 he entered Balliol College, and in the same year published, on the basis of his own observations, an account of Australian life, social, political, and industrial, under the title "New Homes for the Old Country." In 1875 he obtained third class honours in the final classical school, having previously taken the same place in "Moderations," and in the following year he obtained the Chancellor's prize for an English essay, on the subject of "The Political and Social Results of the Absorption of Small Races by Large." On leaving Oxford, he returned to Australia as private secretary to Sir George Bowen, then Governor of Victoria; but, as the term of office of the latter had almost expired, his stay in the colony was not a lengthy one. His next sphere of action was the West Indies, whither he proceeded in 1880, as Commissioner to inquire into the effects of the sugar bounties. In 1882 he received a similar appointment in connection with the subject of West Indian administration, and for his

services in this direction he was soon afterwards made a C.M.G. In 1885 he assisted Sir Charles Warren in the pacification and organization of Bechuanaland, then formed into a crown colony; and two years later his services (as joint commissioner) were requisitioned for the revision of the constitution of Malta, for which he was made a K.C.M.G. His best-known work, however, was perhaps that concerned with the Behring sea question, on which he was engaged during 1891 and 1892 as British Commissioner, and subsequently as adviser to the British Government during the progress of the arbitration.

Since 1885 he had sat as a member for the Kirkdale division of Liverpool, his wide and varied experience serving him in good stead in that capacity, and winning him general respect. He wrote much, in magazines and elsewhere, on subjects connected with political economy or of general interest. He was a keen sportsman and warmly devoted to golf and yachting, which last served in part as a means of gratifying his decided love of travel. It was during his cruise to the north for the observation of the eclipse of 1896 that he was enabled to give an early welcome from the unknown polar regions to Dr. Nansen, who subsequently became his guest during his visit to this country. Sir George became a member of our Society in 1894.

Frederick Jeppe.

It is with regret that we place on record the death of Mr. Frederick Jeppe, which took place as long ago as August last. The deceased was a native of Germany, and settled in the South African Republic in 1862. He held several government appointments, and at the time of his death was chief draughtsman in the State Survey Department at Pretoria. He has deserved well of his adopted native country by making known its geographical features, mainly by the publication of maps. The first of his maps of the Transvaal appeared in a supplement to *Petermanns Mitteilungen* in 1868.* It is based mainly upon surveys made by M. Forssman, C. Mauch, F. Hammer, and others, and is accompanied by an illustrative text. Nine years later he published a second map, which exhibits vast progress in our knowledge of the country,† in explanation of which he wrote "Notes on the Physical and Geological Features of the Transvaal," which were published in our *Journal* (1877, pp. 217–250). A third map of the Transvaal was published by him in 1889, on an enlarged scale.‡ In addition to these general maps, we owe him several excellent maps of interesting portions of the state, the last, a 'Map of the Southern Goldfields of the Transvaal' (1 : 240,000), having been published at Pretoria in 1896. An article by him on "The Kaap Goldfields," appeared in the *Proceedings* (1888, pp. 438–446), and another on the "Zoutpansberg Goldfields," in the *Geographical Journal*, vol. i. 1893, pp. 213–237.

Besides maps, Mr. Jeppe published a 'Transvaal Year-book and Almanac,' for the first time in 1877, which abounds in useful geographical and statistical information. Mr. Jeppe was an honorary corresponding member of our Society.

* 'Original Map of the Transvaal, or South African Republic,' scale 1 : 1,850,000.

† 'Map of the South African Republic, and the Surrounding Territories,' 1 : 1,850,000. Pretoria, 1877.

‡ 'Map of the Transvaal, or South African Republic,' 1 : 1,000,000. London : Dulau.

CORRESPONDENCE.

A New Mountain Aneroid Barometer.

Mr. Murray published in 1891 a pamphlet ('How to Use the Aneroid Barometer,' 8vo, pp. 61: John Murray, Albemarle Street, London), which gave some of the results that had been obtained from numerous comparisons of the aneroid against the mercurial barometer, made by me between the years 1879 and 1890. The earlier of these comparisons were made out-of-doors up to a height exceeding 20,000 feet; and the later ones were made in the workshop down to a pressure of 14 inches, which is about what one may expect to experience at the height of 20,770 feet above the sea.

These comparisons, or experiments, brought out certain facts. It was found that all aneroids which were tested, upon being submitted to diminution in atmospheric pressure, lost upon the mercurial barometer. It was found, if an aneroid was placed under the receiver of an air-pump (having a mercurial barometer attached, in such a way that one could cause simultaneous reduction in pressure for both barometers), that, although the aneroid might for a moment read truly against the mercurial when pressure was reduced say to 20 inches, it would in a very short time read *lower* than it. It was found that this loss augmented constantly, and that in a single day, under a constant pressure of 20 inches, it might grow to half an inch and even more; and that the loss always continued to augment for several weeks, sometimes so long as seven or eight weeks. The lower the pressure, and the greater the length of time the diminution in pressure was experienced, the greater was the loss in any individual aneroid.

It was found also that aneroids commenced to recover this loss immediately pressure was restored, no matter whether it was restored entirely and suddenly, or gradually and partially as it is when a traveller is coming downhill; and that in course of time after return to the level of the sea (or if kept artificially at a pressure of 30 inches or thereabouts) an aneroid might recover all its previous loss, even although it might have experienced very low pressures, and been kept at such pressures for months at a time. Hence, in consequence of the *loss*, travellers or surveyors may be led to very much exaggerate their altitudes (unless they carry some standard for comparison which will enable them to determine the errors of their aneroids on the spot); and in consequence of the *recovery* they may be led to believe, on return to the level of the sea, that their aneroids have been working well and truly, although they may have, as a matter of fact, been doing quite the reverse.

The publication of these results led to improvements in the manufacture of the aneroid, and *some* instruments of the best class which have been constructed in late years show a distinct advance in accuracy; but it is clear, from references which have been made quite recently by travellers to their aneroids, that there are *others* which are still a long way from perfection. Mr. E. A. Fitz Gerald, for example, says in the *Geographical Journal*, November, 1897, "Our aneroids played us some very curious tricks. One of them, on being taken to the height of 19,000 feet, registered 12 inches"—that is to say, it indicated an altitude of about 25,000 feet, and was about 30 per cent. in error. This is several degrees worse than the behaviour of the instrument which was employed by Mr. Joseph Thompson during his journey in Morocco in 1888, though even *his* aneroid is said to have made his life a burden to him. One can well believe it did all that was imputed to it; for after Mr. Thompson's return, when it was tested under the air-pump at a pressure corresponding to a little lower than the height of Mont Blanc, upon being kept a week at that pressure, it acquired an error of −1·267 inch, the value of which amount, at the altitude in question, exceeds 2000 feet.

Manufacturers have endeavoured to tackle the difficulty in one way, and inventors have approached it in another. The former have attempted to abolish the fundamental cause of error, and the latter see that aneroids can be rendered of greater service in the measurement of altitudes by shortening the length of time that they need be exposed to the influence of the atmosphere. The most recent experimental aneroid which has been constructed with this view is the invention of Colonel H. Watkin, C.B., chief inspector of position-finding in the War Department.

In introducing it, Colonel Watkin said in effect, though not in these words, "You point out that all aneroids lose upon the mercurial barometer when submitted to a diminution of pressure; that this loss is large when pressure is much diminished; and that the loss continued to augment for several weeks. It is, you say, apparent that the *extent* of the loss which will occur in any aneroid upon the mercurial barometer on being submitted to a diminution in pressure depends (1) upon the duration of time it may be submitted to diminished pressure, and (2) upon the amount of the diminution in pressure; and that it follows that the errors which will be manifested by any particular aneroid will be greatest when it is submitted to very low pressures for long periods. Accepting this as a correct statement of facts, I propose to construct an aneroid barometer that can be put in action when required, and 'put out of gear' or 'thrown out of action' when it is not wanted for use; and I propose to construct it in such a way that it shall not be exposed to the influence of variations in atmospheric pressure when it is *out* of action—in short, that no variations in atmospheric pressure, however large they may be, shall produce any effect upon it except at the time when it is put in action for the purpose of taking a reading." The following description, supplied by Colonel Watkin, explains the manner in which this is done:—

"In order to relieve the strain on the mechanism of the aneroid, and only permit of its being put into action when a reading is required, the lower portion of the vacuum-box, instead of being a fixture (as is the case with ordinary instruments), is allowed to rise. Without entering into details of construction, this is effected generally by attaching to the lower portion of the vacuum-box a screw arrangement, actuated by a fly nut on the outside of the case. Under ordinary conditions this screw is released, and the vacuum-box put out of strain. When a reading is required, the fly nut is screwed up as far as it will go, thus bringing the instrument into the normal condition in which it was graduated."

At first mention this idea did not appear promising, as it seemed that, however quickly an observation might be made, the aneroid would be losing upon the mercurial all the time that the reading was being taken; that when the aneroid should be thrown out of action, this loss would be shut up; and that when readings should be taken on succeeding occasions, the loss which would occur during them would accumulate; and that this would go on until at length the error would become almost or quite as serious as in an ordinary aneroid. I was, however, very urgently required to give the instrument a fair trial in the field; and after satisfying myself that, when thrown out of action, it was not affected by variations in atmospheric pressure (amongst other ways, by keeping it for six weeks under a receiver in which pressure was maintained constantly at 17 inches), I commenced to compare it against the mercurial barometer in Switzerland in last September, having intentionally refrained from taking a reading for six weeks further, after it was released from the air-pump, in order to obtain confirmation of the opinion that it was, when thrown out of action, actually impervious to the influence of variations in atmospheric pressure.

I commenced these comparisons at Zermatt on September 3 (the height of

Zermatt, according to the Swiss Federal Survey, is 5315 feet), and between the 3rd and the 8th took twenty-one readings—that is to say, the aneroid was put in action and was thrown out of action twenty-one times in the above-mentioned period. I was interested to observe whether the accumulation of loss would take place. It did occur, but the total amount was small. The aneroid had a plus error of 0·122 of an inch the first time it was used, and this was reduced to + 0·069 of an inch at the last reading. Thus there was, on an average, a loss of 0·00252 (or $\frac{252}{100000}$) of an inch on each occasion that a reading was taken.

On September 9 I carried the barometers to the top of the Gornergrat, but diverged from the way up to the summit of a minor peak called Gugel (S. F. Survey, 8882 feet). The error of the aneroid at Zermatt at the last reading was +0·069 of an inch, and on the top of Gugel it was +0·057, or $\frac{57}{1000}$ of an inch. The difference of level between the stations, it will be seen, was 3567 feet.

From the top of Gugel I came down for lunch to the hotel called the Riffelhaus (S. F. Survey, 8429 feet), and there the error of the aneroid was +0·041 of an inch.

From the Riffelhaus I went to the top of the Gornergrat (S. F. Survey, 10,289 feet), and at 4.20 p.m. the error of the aneroid appeared to be −0·052 of an inch. The readings were—

Merc. bar. inches.	Temp. in shade.	Correction for temp. inch.	Merc. bar. red. to 32° F. inches.	Aneroid. inches.	Error of aneroid. inch.
20·923	55·5	−0·051	20·872	20·820	−0·052

I was not satisfied with this comparison. The sun's rays had been piercingly hot during the ascent, and the mercurial barometer had been unavoidably exposed to them. When set up in the shade, its sensitive, attached thermometer speedily took up the temperature of the air. It fell to 55·5 Fahr., and would not fall lower. But the mercury in the barometer continued to fall long afterwards, because it was not cooled down to the temperature of the air. It is not improbable that the temperature of the mercury in the barometer was as high as 75° Fahr. at the time it was read. Assuming that this was the case, the following would be the correct comparison:—

Merc. bar. inches.	Temp. of mercury.	Correction for temp. inch.	Merc. bar. red. to 32° F. inches.	Aneroid. inches.	Error of aneroid. inch.
20·923	75°	−0·087	20·836	20·820	−0·016

On my return to Zermatt after a descent of 4974 feet, I was curious to observe what alteration there would be in the error of the aneroid. At the last reading prior to starting it had been +0·069 of an inch, and at the first one taken after the return it was precisely the same! More astonishing than this, the mean of eight readings taken on the four following days (September 10 to 13) came out +0·068 of an inch.

On September 13 I went again to the Gornergrat, and between 12 and 3 read the barometer three times. The following figures show the means of the three readings:—

Merc. bar. inches.	Temp. in shade.	Correction for temp. inch.	Merc. bar. red. to 32° F. inches.	Aneroid. inches.	Error of aneroid. inch.
20·780	50° F.	−0·052	20·729	20·717	−0·012

This supported the opinion that the reading on September 9 was taken too soon, and that the temperature indicated by the attached thermometer was lower than the temperature of the mercury in the barometer. The mean of two comparisons at Zermatt after this second visit to the Gornergrat gave as the error of the aneroid +0·030 of an inch.

I then went down the valley of Zermatt, and stopped successively for several days at each of the three villages, Randa, St. Nicholas, and Visp. At Randa

(S. F. Survey, 4741 feet) I made six comparisons on three days, and the mean error of the aneroid came out 0·000. At St. Nicholas (S. F. Survey, 3678 feet) I took five readings on three days, and the mean error was −0·019 of an inch; and at Visp (S. F. Survey, 2165 feet) I took three readings on two days, and the mean error was −0·006.

I then thought it would be well to submit the aneroid to a sharp and sudden diminution in pressure, and took the train back to Zermatt to see what would happen through a rise of 3150 feet, made in 2 hrs. 20 min. At the last reading at Visp the error was −0·002 of an inch, and at Zermatt I found it was +0·011. On return to Visp, the mean error of five comparisons made on three days was +0·017 of an inch; at Sierre (S. F. Survey, 1765 feet), five readings on four days showed a mean error of −0·010, and the mean error of the last two comparisons, made at Geneva (S. F. Survey, 1227 feet), amounted to −0·030 of an inch. From September 9 to October 17 the aneroid was put in action forty-four times, and its loss upon the mercurial in that time amounted to 0·099 of an inch. A plus error of 0·069 of an inch at Zermatt was changed into a minus one of 0·030 of an inch at Geneva. This was equivalent to a loss of 0·00225 (or $\frac{225}{100000}$) of an inch on each occasion that it was used.

The remarkable nature of these figures will be apparent to any one who has acquaintance with the barometer, and especially to those who have used aneroid barometers in the field. Upon two occasions Colonel Watkin's instrument read so truly against the mercurial that I was unable to detect any discrepancy between the two instruments. At Randa, the mean of six readings gave as a result *no* error. Stress need not be laid upon these happy agreements. It is more to the purpose to draw attention to column G in the following table. If the eye is run

A Place of observation.	B Date. 1898.	C Altitude.	D Merc. bar. reduced to 32° F.	E Watkin's mountain aneroid.	F Number of observations.	G Mean error of aneroid.
		Feet.	Inches.	Inches.		Inch.
Zermatt	Sept. 3–8	5,315	25·006	25·096	21	+0·090
Top of Gugel ...	„ 9	8,882	21·963	22·020	1	+0·057
Riffelhaus	„ „	8,429	22·319	22·360	1	+0·041
Top of Gornergrat	„ „	10,289	20·872 (?)	20·820	1	−0·052 (?)
Zermatt	„ 10–13	5,315	24·912	24·980	8	+0·068
Top of Gornergrat	„ 13	10,289	20·729	20·717	3	−0·012
Zermatt	„ 13–14	5,315	24·917	24·947	2	+0·030
Randa	„ 15–17	4,741	25·687	25·687	6	0·000
St. Nicholas ...	„ 17–22	3,678	26·443	26·424	5	−0·019
Visp	„ 23–29	2,165	27·726	27·720	3	−0·006
Zermatt	„ 30	5,315	24·475	24·492	2	+0·017
Visp	Oct. 4–7	2,165	27·890	27·907	5	+0·017
Sierre	„ 9–12	1,765	28·131	28·121	5	−0·010
Geneva	„ 13–17	1,227	28·332	28·302	2	−0·030

down that column, and neglects the hundredths and thousandths of an inch, it will be seen that it reads 0·0 from first to last! Better results might have been attained, and I believe would have been attained, if the readings had been taken with greater rapidity. Attention must be paid to two points when employing this instrument. The first is to keep it constantly shut off from the influence of the atmosphere, except at the times when readings are to be taken; and the second is to take the readings as quickly as possible.

Finally, I feel confident that, in the hands of those who will give the requisite attention, extraordinary results may be obtained from Watkin's mountain aneroid in observations made for altitude, and in determining differences of level.

The comparisons were made against a mountain mercurial barometer, Fortin principle, which was graduated to read on the vernier to $\frac{1}{200}$ of an inch, and by estimation could be read to $\frac{1}{1000}$. Before starting in July, this barometer was compared against its maker's standard, and it was found to have no error. On return in October it was again examined and compared, and it was found that it had not taken in any air.

The aneroid which was observed was $4\frac{1}{2}$ inches in diameter, and was divided to 0·05 of an inch. Its scale ranged from 31 to 17 inches, and it weighed when in its leather sling case $2\frac{1}{2}$ lbs. It was made by Mr. J. J. Hicks, 8, Hatton Garden. Aneroids of this type will be called Watkin's mountain aneroids, as they are especially devised for mountain travellers and for survey work amongst mountains.

EDWARD WHYMPER.

The Geographical Terms "Tirah" and "Afghanistan."

WITH your permission, I should like to be allowed to make a few remarks in correction of some errors contained in the "Tirah" article by Colonel Sir T. H. Holdich, C.B., which appeared in the October number of the *Journal*, and regret that I have been unable to address you before on the subject.

The word "Tí-ráh" has been known for centuries past as "*a geographical term*," and its original inhabitants, who were Tájziks, and not of the Afghán race, are known to history as Tí-ráhís, who spoke a distinct language called Tí-ráhí after them. At the commencement of Akbar Badshah's reign there were no Afgháns in Tí-ráh, and the Afrídí Afgháns were then located elsewhere.

"*Afridistan*" is a recently coined English term, like "Kakuristan," "Wuzeristan," "Yaghistan," and the like, and is unknown to the people themselves.

At p. 354 of the article, the author says, "*Afghanistan, to begin with, is a name which we have applied to the kingdom ruled by the Amir. It is not a geographical term recognized by the Afghans.*" I can assure him, and also show him, that that geographical term has been known and recognized "from time immemorial" almost. It is constantly mentioned in history and geography *for the last eight hundred years and more*, as may be seen by referring to the history of Abu-l-Fazl-i-Baihakí, written in 1059 of the Christian Era, and in that of the Gardaizí, written a few years after; and so on, down to the present day, in every work almost, treating on that part. What "Afghánistán" means may be seen from my 'Notes on Afghánistán,' etc., pp. 453–468.

As to the statement that "*Afghan is not the ethnographical distinction of that people*," I can also show that it is used along with the term Afghánistán from the time these people are first mentioned in history, *just nine hundred years ago*, as proved from the writings of Al-'Utbí, in the "Tárikh-i-Yamíní," who was minister of the ninth Sámání ruler, Amír Núh, who ascended the throne in 957 A.D., and died 997.

Afgháns generally call themselves, particularly in their own country and among themselves, Pushtún and Pushtanah; and *those only*—whether at home or abroad—whose mother tongue is the Pushto, are Pushtúns or Afgháns. But the fact of speaking the Pushto language no more makes a man an Afghán than it makes an Englishman speaking Hindústání a Hindú. Some mongrel tribes, of little or no account, in the north-west of the Panj-áb, would greatly like to be accounted Patáns or Afgháns, which names refer to one and the same people.

"*The Afghans*" do not "*call themselves Duránis;*" only a portion of them do so. The Durránis are but an offshoot—but now become a very numerous one—of

the Tarín Afgháns; and for centuries, and down to one hundred and twenty-five years ago, at the time of Ahmad Sháh, the Abdálí, who assumed the title of "Durr-i-Durrán," or "Pearl of Pearls," they were known only as the Abdálís. From Ahmad Sháh's time they assumed the name of Durránís. The Abdálís consist of three main divisions; the Sadozí, the royal division or sub-tribe; the Bárakzí, to which the present Amir belongs; and the Alízí. All these contain numerous branches, and these *alone* constitute the Durráni Afgháns.

I may also mention that "Suwátí," "Buner-wál" (such a word as "*Bonerwhal*" is unknown), and "Bájawrí," are not the names of any tribes or portions of tribes of Afgháns, but are merely applied to those Afgháns who inhabit those tracts, just as the people who inhabit the Panj-áb are Panjábis, those of Sind, Sindís, and those dwelling in London, Londoners.

Respecting the geographical account of Tíráh, I have only to remark that it is not surprising that "neither Alexander, nor Mahmud of Ghazni, nor Baber (Bábar?), nor Ahmed Abdallah"—and Timúr and half a score of others might be added—"were attracted to entangle themselves among the difficult passes about Tirah," when they had the choice of several far easier routes. "Ahmed Abdallah" is, unfortunately, unknown to fame. It is only the English who always choose the most difficult routes. I may mention, however, that the troops of Akbar Bádsháh traversed Tíráh in all directions from time to time, in pursuit of the schismatic—the "Mahdist," in fact—Pír-i-Roshán, *alias* Pír-i-Tárík, and his followers, among whom were the Tíráhí Tájzíks, from which period the ruin of the latter commenced, and they finally disappeared therefrom, and the Afrídí Afgháns, who are no more "*Rajputs*" than they are Turks, Greeks, or Chinese, first obtained possession of Tirah. See my 'Notes,' p. 391.

H. G. Raverty, Major.

November 10, 1898.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898-1899.

Second Ordinary Meeting, Monday, November 28, 1898.—Sir Clements Markham, K.C.B., President, in the Chair.

Elections.—*Louis J. Abrahams; Sir C. Thomas Dyke Acland, Bart.; Lieut. Henry S. L. Alford (Royal Scots Fusiliers); H. Aris, M.A. Cantab.; Rev. Arthur Baldwin; William Bruce Bannerman; Thomas Barron (Geological Surveyor to Egyptian Government); Hugh J. Llewellyn Beadnell; Charles Bethell; Lord Basil Blackwood; Frank M. Bladen; Lieut. H. Acton Blake, R.N.R.; Stanley Boyd, F.R.C.S.; Gilbert Edward Brooke, B.A. Cantab., L.R.C.P., L.R.C.S.; Edgar Brooks; Colonel Louis F. Brown, R.E.; Frank Thomas Bullen; John Butler, F.R.I.B.A.; John Campbell-Thomson, C.E.; John Kirk Child; Edwin Chill, M.D.; J. Lester Clark; W. W. Cobb, M.A. Oxon., F.C.S.; Norman Alexander Lindsay Cockell; Geo. Kynaston Cockerill (Lieut. 28th Punjab Infantry); John Boyd Coles; Rev. William Copeland; Captain Arthur Robert Denne (Indian Staff Corps); Lieut. H. De Prée (Royal Horse Artillery); Arthur Diósy; Rev. Frederick W. Barrow Dorset; Sievers Drewitt; Sir John Evans, K.C.B., D.C.L.; Thomas Ernest Preston Gardner; William Henry Gardner; Albert Edward Garrett; Edmund Johnston Garwood, M.A., F.G.S.; Captain Elmitt George (Antrim Artillery); William Henry Gleadell; Harry Good, C.E.; Gilmore*

Goodland; Rev. G. Golding-Bird, M.A.; Leonard Gorringe; Frederick H. Grinlinton (Surveyor-General of Ceylon); Captain Bertrand Evelyn Mellish Gurdon, D.S.O. (Indian Staff Corps); Count Leigh Hamong; Henry Handcock; Alfred Croven Harrison; Colonel H. H. Harvey-Kelly, I.S.C.; William Axel Herty; Dudley Francis Amelius Hervey; Wm. Tyrrell Osborn B. Hewett; Hiram Milliken Hiller, M.D.; James John Hills; Nicholas Hillyer; Francois Hopp; Commander William Van Sittart Howard, R.N.; John Hampden Jackson; J. W. Jamieson; Montague George Jessett; Heinrich Wilhelm Ferdinand Kayser; Rudolph Kohnstamm; George James Malcolm Kearton; Walter G. Klein; Roger Francis Lambe; Abraham Kingsley Macomber; Captain W. D. McSwiney (7th Dragoon Guards); Sam Mavor; Sidney Mayers; Robert Mitford, J.P.; Frederick Rice Markham; R. Dorsey Loraine Mohun; Robert Allan Moon; Lieut. Donald I. Munro, R.N.; Frank Naumann; Charles Albert Neuman; Charles Andrew O'Brien; Lieut.-Colonel C. S. Parsons, R.A.; E. Hope Pearse; John Wyatt Peters; G. Bettesworth Piggott; William Frederick Pocock; Captain S. H. Powell, R.E.; Captain John S. Purvis, R.E.; Julian Ralph; Arnot Reid; R. Nevill Roberts; T. J. Robertson; Robert W. Rogers, Ph.D., D.D.; William Sandover; Major-General G. H. Saxton; Leveson Edward Scarth, M.A.; Lewis Boyd Sebastian, M.A.; George William Shaw; Lieut. Hugh T. G. Stack, R.N.; Clement Locke Smiles; Edwin Smith; Lieut.-Colonel Edward Guy Selby Smyth; Surgeon-Major George Frederick Alexander Smythe (Army Medical Staff); Lieut. Richard Sparrow (7th Dragoon Guards); Alexander Young Spearman (1st Batt. Royal Warwicks); Captain E. A. Stanton (Oxfordshire Light Infantry); W. H. Stuart; Dimitri N. Tadros; Thomas E. Thickpenny; Lieut. C. Tylden-Pattenson, R.E.; Theodore Gustav Wanner; William J. E. Warring-Stone, M.A.; Prof. W. W. Watts (Mason College); Percy G. B. Westmacott; Arthur M. White.

The PRESIDENT said: The very long list of new Fellows we have heard read to-night is of course a subject of congratulation to us; not only are our numbers increasing rapidly, but the intelligent interest that the Fellows take in the work of the Society is also increasing rapidly, as shown by the numbers that come to consult our map collection. This year there have been a thousand more than there were last year, and last year there were a thousand more than the year before that.

The paper read was:—

"A Year on Christmas Island." By Chas. W. Andrews, B.SC., F.G.S.

Third Ordinary Meeting, December 12, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Lieut. P. B. Osborn (Oxford Light Infantry); George Rooke Penrose, M.B.; Lieut. T. E. Scott, D.S.O. (3rd Sikhs); Herbert G. Skill; Henry Watts.*

Mr. JOHN BARROW.

The PRESIDENT said: Before commencing the business of the evening, I cannot help alluding to the death of our old friend Mr. John Barrow, of which I have only just heard. He was the father of our Society, being the senior member, and he died at the great age of 91. In former years he was a very active member of the Society. He was the son of Sir John Barrow, in whose rooms at the Admiralty the committee met which formed this Society in 1830. John Barrow followed in his father's footsteps. He was secretary of the old Raleigh Club, which led to the founding of this Society, and he always took the deepest interest in it. Above

all, he was the friend of naval officers, and many of them of an earlier generation owed a great deal to John Barrow, more especially all arctic officers, who received from him every sort of help and kindness.

The Paper read was:—

"Exploration in the Caroline Islands." By F. W. Christian.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Glaciers. **Forel, Lugeon, and Muret.**

Jahrb. Schweizer Alpenclub **33** (1897–98): 249–261.

Les variations périodiques des glaciers des Alpes. Par Dr. F. A. Forel, Dr. M. Lugeon, E. Muret. Dix-huitième rapport. 1897. *With Map.*

Austria. *Nineteenth Century* **44** (1898): 957–970. **Lützow.**

The Bohemian Question. By Francis Count Lützow.

Austria—Earthquakes. **Becke.**

Sitzb. k. A.W. Wien **106**, Abth. I. (1897): 46–59, 103–116.

Mittheilungen der Erdbeben-Commission der kaiserlichen Akademie der Wissenschaften in Wien. II. Bericht über das Erdbeben von Brüx am 3 November 1896, von Friedrich Becke. *With Sketch-map.*—III. Bericht über das Erdbeben vom 5 Jänuer 1897 im südlichen Böhmerwald, von Prof. F. Becke. *With Sketch-map.*

Austria—Earthquakes. *Sitz. k. A.W. Wien* **106**, Abth. I. (1897): 467–486. **Mazelle.**

Mittheilungen der Erdbeben-Commission der kaiserlichen Akademie der Wissenschaften in Wien. IV. Bericht über die im Triester Gebiete beobachteten Erdbeben vom 15 Juli, 3 August und 21 September 1897. Von Eduard Mazelle.

Austria—Earthquakes. *Sitz. k. A.W. Wien* **106**, Abth. I. (1897): 20–45. **Mojsisovics.**

Mittheilungen der Erdbeben-Commission der kaiserlichen Akademie der Wissenschaften in Wien. I. Berichte über die Organisation der Erdbebenbeobachtung nebst Mittheilungen über während des Jahres 1896 erfolgte Erdbeben, zusammengestellt von Dr. Edmund v. Mojsisovics.

Austria—Hungary—Carpathians. **Uhlig.**

Sitz. k. A.W. Wien **106**, Abth. I. (1897): 188–206.

Ueber die Beziehungen der südlichen Klippenzone zu den Ostkarpathen. Von Prof. V. Uhlig. *With Maps.*

Austria—Moravia. *Deutsche Rundschau G.* **20** (1898): 529–538. **Trampler.**

Die Burghöhle im Punkwathale in Mähren. Von R. Trampler. *With Illustrations.*

On a number of caves in the Punkwa valley examined by the author in 1897. The illustrations include plans of the caves and drawings of bones found in them.

Austria—Poland. ——

Akademia Umiejętności w Krakowie. Sprawozdanie Komisyi Fizyograficznej. T. XXXII. w Krakowis, 1897. Size 9¼ × 6, pp. xviii., 232, 318, and 54. *Maps. Presented by the Academy of Sciences of Cracow.*

The first article contains a daily meteorological register for 1896 from a number of stations in Poland, the second is a flora of Poland, and there is also an article on the geology of some districts illustrated by maps.

Austria—Tyrol. **Battisti.**

Cesare Battisti. Il Trentino. Saggio di geografia fisica e di antropogeografia. Trento: G. Zippel, 1898. Size 10 × 7, pp. viii. and 326. *Map and Illustrations. Presented by the Author.*

This volume discusses the regional geography of the part of South Tyrol in the neighbourhood of Trient, with an orographical map of the surrounding district, and numerous photographs of mountain scenery.

Baltic Sea. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **15** (1898): 581–656. **Toose.**

Over de Oostzee en hare beteekenis voor Handel en Scheepvaart. Door W. Toose.

On the trade of the Baltic sea.

Belgium. *C. Rd.* **127** (1898): 641–645. **Martel.**

Nouvelles observations dans la grotte et la rivière souterraine de Han-sur-Lesse (Belgique). Note de M. Martel. *With Plan.*

British and German Trade. **Gastrell.**

Results of British and German Trade during the year 1897. Foreign Office, Annual No. 2040, 1898. Size 10 × 6½, pp. 12. *Price* 1*d.*

Bulgaria. *Z. Ges. Erdk. Berlin* **33** (1898): 201–253. **Cvijić.**

Das Rila-Gebirge und seine ehemalige Vergletscherung. Von Prof. Dr. J. Cvijić. *With Maps.*

Bulgaria. *Deutsche Rundschau G.* **21** (1898): 66–74. **Meinhard.**

Durch das Iskerdefilée. Von Friedrich Meinhard. *With Illustrations.*

Europe—Travel. ——

Cettinje to Windsor. Being an Account of the Visit of Nicolas I., Prince of Montenegro, to Her Majesty the Queen, May, 1898. By R. J. K. 1898. Size 7 × 5, pp. 72. *Illustrations. Presented by Messrs. Hatchard & Co.*

France. *C. Rd.* **127** (1898): 678–680. **Nicklès.**

Sur la tectonique des terrains secondaires du sud de la Montagne-Noire. Note de M. René Nicklès.

France—Corsica. **Joanne.**

Collection des Guides-Joanne. Itinéraire Général de la France. Par Paul Joanne. Corse. Avec un Appendice—La Corse à Bicyclette. Par M. A. Courtet. 6 Cartes et 3 Plans. Paris: Hachette et Cie., 1898. Size 6½ × 4½, pp. 18, lxxii., and 252.

France—Gironde. *B.S.G. Com. Bordeaux* **21** (1898): 320–330. **Hautreux.**

La Gironde de Pauillac à la mer, le passé, le présent. Par M. A. Hautreux. *With Maps.*

France—Havre. *Rev. G.* **43** (1898): 241–263. **Vallée.**

Le port du Havre. Par L. Vallée.

France—Lorraine. *Rev. G.* **43** (1898): 321–333. **Auerbach.**

La carte de Lorraine sous le duc Charles III. (Gérard Mercator, Hans van Schille, Thierry Alix). Par M. Bertrand Auerbach.

France—Nièvre. *B.S.G. Com. Bordeaux* **21** (1898): 352–359. ———
La vallée de la Nièvre. Par J. V.

The reason why this comparatively insignificant river was selected to give its name to a department is stated to be the great industrial importance of the region it waters at the close of the eighteenth century.

France—Pyrenees. *C. Rd.* **127** (1898): 740–742. **Delebecque and Ritter.**
Sur quelques lacs des Pyrénées-Orientales, des Hautes-Pyrénées et des Basses-Pyrénées. Note de MM. André Delebecque et Etienne Ritter.

France—Pyrenees. *Mém. S. Spéléologie* **3** (1898): 1–40. **Viré.**
Les Pyrénées souterraines (1re campagne, 1897). (Les Grottes de Bétharran, Escalère, Labastide, etc.) Par M. Armand Viré. *With Plans and Illustrations.*

France—Southern. **Hall.**
The Romans on the Riviera and the Rhone. A sketch of the Conquest of Liguria and the Roman Province. By W. H. (Bullock) Hall. London: Macmillan & Co., 1898. Size 9 × 6, pp. x. and 194. *Maps and Illustrations. Price* 6*s. Presented by the Author.*

After an introductory chapter, the author describes the military operations of Hannibal in the Rhone valley and his famous crossing of the Alps, and then goes on to consider the Roman invasion and occupation of southern Gaul, with a variety of illustrations of Roman buildings and a series of maps showing the actual configuration of parts of the coast and its former outline. The author deals in details with several disputed questions regarding routes.

Germany. *Deutsche Rundschau G.* **21** (1898): 61–66. **Herden.**
Die Bildung der norddeutschen Flusssysteme und ihrer Stromläufe. Von P. Herden. *With Map.*

On the development of the river-system of the North German plain.

Germany. *M. Ver. Erdk. Halle* (1898): 1–7. **Maenss.**
Die Teilung der Elbe bei Magdeburg in den neueren Jahrhunderten. Von Prof. J. Maenss. *With Maps.*

An account of the changes in the bed and course of the Elbe in the immediate neighbourhood of Magdeburg.

Germany. *M. Ver. Erdk. Halle* (1898): 104–187. **Schulz.**
Entwicklungsgeschichte der phanerogamen Pflanzendecke des Saalebezirkes. Von Dr. A. Schulz.

Germany—Frisian Islands. *Deutsche Rundschau G.* **21** (1898): 18–22, 75–80. **Axelsen.**
Die Nordfriesen. Von Postsecretär Peter Axelsen. *With Illustrations.*

Germany—Northern Plain. *G.Z.* **4** (1898): 481–508. **Keilhack.**
Die Oberflächenformen des norddeutschen Flachlandes und ihre Entstehung. Von Dr. K. Keilhack.

Germany—Thuringia. *M. Ver. Erdk. Halle* (1898): 80–97. **Reischel.**
Das thüringische Bauernhaus und seine Bewohner. Von Dr. G. Reischel.

Germany—Thuringia. *M. Ver. Erdk. Halle* (1898): 8–79. **Schulz.**
Die jährlichen Niederschlagsmengen Thüringens und des Harzes und ihre Verteilung auf die einzelnen Jahreszeiten und Monate. Von Dr. Fritz Schulz. *With Maps.*

Hungary—Budapest. **Körösy.**
Publicationen des Statistischen Bureaus der Haupt- und Residenzstadt Budapest. XXV. 3. Die Hauptstadt Budapest im Jahre 1891. Resultate der Volksbeschreibung und Volkszählung. Von Dr. Josef v. Körösy. Dritter Band. (Pp. 182 and 162).—XXVI. Die Sterblichkeit der Haupt- und Residenzstadt Budapest in den Jahren 1886–1890 und deren Ursachen. Von Dr. J. von Körösy. (Pp. x., 138, and 206.)—XXVII. Resultate der am 15. November 1896 durchgeführten Conscription der Bevölkerung Budapests. Von J. von Körösy.—XXVIII. Die Bauthätigkeit in Budapest in den Jahren 1885–1895. Von Dr. J. v. Körösy. Berlin: Puttkammer & Mühlbrecht, 1898. Size 11 × 8.

Hungary—Vital Statistics. **Körösy and Thirring.**
Die Natalitäts- und Mortalitäts- Verhältnisse Ungarischer Städte in den Jahren 1878-1895. Anlässlich des Budapester Internationalen Congresses für Hygiene und Demographie, auf Grund der im Budapester Communal statistischen Bureau gesammelten original Beobachtungen bearbeitet von Dr. Josef v. Körösy und Dr. Gustav Thirring. Budapest und Berlin, 1897. Size 9½ × 6½, pp. 116. *Presented by Dr. J. v. Körösy.*

Iceland. *Petermanns M.* **44** (1898): 217–222. **Keilhack.**

Aus dem nördlichen Island. Nach dem Reisebericht Dr. Th. Thoroddsens über den Sommer 1896. Von Dr. K. Keilhack. *With Map.*

Iceland. *G. Tidskrift* **14** (1898): 165–169. **Thoroddsen.**

Hovedresultaterne af Dr. Th. Thoroddsens Undersøgelser paa Island i Aarene 1881–1898.

A summary of the chief results obtained by Dr. Thoroddsen during the last nine years.

ASIA.

Asia—Historical. ——

B. Union G. Nord de la France **18** (1897): 28, 120, 224; **19** (1898): 57, 108.

Le voyage d'Authony Jenkinson dans l'Asie centrale en 1558. Par H. Conrad.

Asia—Historical. *J.R. Asiatic S.* (1898): 795–808. **Beames.**

The Geography of the Kandahár Inscription. By John Beames.

China. *Oesterreichische Monats. Orient* **24** (1898): 99–104, 113–119. ——

Die Aufstände in China.

China. *Questions Dipl. et Colon.* **4** (1898): 413–419, 457–463. **Fauvel.**

Les chemins de fer en Chine, dernières concessions. Par A. Fauvel. *With Map.*

China. **Hirth.**

Schantung und Kiau-tschóu. Von Friedrich Hirth. Sonderabdruck aus der Beilage zur "Allgemeinen Zeitung," Nr. 218 und 219 vom 27 und 28 September 1898. München, 1898. Size 8½ × 6, pp. 32. *Presented by the Author.*

China. *J.G. Tokyo G.S.* **10** (1898): 304–323. **Jimbō**

Geological Observations in Liautung, North China. By Kotora Jimbō. [In Japanese.]

China. **Tayman.**

Trade of Chinkiang for the year 1897. Foreign Office, Annual No. 2187. 1898. Size 10 × 6½, pp. 8. *Price* ½*d.*

Chinese Empire. **Younghusband.**

Among the Celestials. A Narrative of Travels in Manchuria, across the Gobi Desert, through the Himalayas to India. Abridged from 'The Heart of a Continent.' By Captain Francis Younghusband. London: John Murray, 1898. Size 8½ × 6, pp. viii. and 262. *Map and Illustrations. Price* 7*s.* 6*d. Presented by the Publisher.*

This is the record of Captain Younghusband's great journey from Peking to India through Turkestan, supplemented by a special chapter on the present outlook in Manchuria. 'In the Heart of a Continent' was one of the best books of Asiatic travel, and the cheaper form, in which the most important part of it is here reproduced, should prove particularly welcome.

Chinese Geography. **Schlegel.**

Geographical Notes. III. Ho-ling Kaling. IV. Maliur and Malayu. V. Ting-ki-gi Ting-Gii. By G. Schlegel. Reprinted from the T'oung-Pao, vol. ix. No. 4. Leyden: E. J. Brill, 1898. Size 10 × 6½, pp. 26. *Presented by the Author.*

Chinese Turkestan. *J.R. Asiatic S.* (1898): 809–838. **Howorth.**

The Northern Frontagers of China. By Sir Henry H. Howorth, K.C.I.E. Part x. The Uighurs of Kao-chang and Bishbaligh.

Chinese Turkestan. *Is. Imp. Russian G.S.* **34** (1898): 185–204. **Uspensky.**

From Suidin to Urumtsi. By V. M. Uspensky. [In Russian.]

French Indo-China. **Girod.**

Miss. Catholiques **30** (1898): 54, 66, 78, 88, 101, 113, 125, 138, 148, 163, 173, 185, 196, 209, 221, 233, 246, 258, 270, 283, 294, 306, 319, 330, 341, 354, 365, 377, 390, 403, 414, 424.

Dix ans de Haut-Tonkin. Par M. Girod. *With Map and Illustrations.*

French Indo-China. *Rev. Scientifique* **10** (1898): 585–588. **Lectère.**

La divination chez les Cambodgiens. Par M. Adhémard Lectère.

India—Anthropology. **Thurston.**

Madras Government Museum. Bulletin, vol. ii. No. 2. Anthropology. Eurasians of Madras and Malabar; Note on Tattooing; Malagasy-Nias-Dravidians; Toda

Petition. With Ten Plates. By Edgar Thurston. Madras, 1898. Size 8½ × 5½, pp. 69–130.

India—Bhotan. **Sandberg.**

Bhotan: the Unknown Indian State. By Rev. Graham Sandberg. (From the *Calcutta Review*, September, 1898.) Size 9 × 5½, pp. 28. *Presented by the Author.*

A summary of our knowledge of Bhotan, the only one of the Himalayan States with which there is absolutely no British intercourse.

India—Bombay. *J. Manchester G.S.* **14** (1898): 130–175. **Birdwood.**

The Recent Epidemics of Plague in Bombay. By H. M. Birdwood, C.S.I., etc. *With Map, Diagrams, and Illustrations.*

India—Botanical Survey. ——

Report of the Director of the Botanical Survey of India for the year 1897–98. [Calcutta, 1898.] Size 13½ × 8½, pp. 38.

India—Botany. *J. Linnean S. (Botany)* **34** (1898): 1–146. **Clarke.**

On the Subsubareas of British India, illustrated by the detailed Distribution of the *Cyperaceæ* in that Empire. By C. B. Clarke, M.A., F.R.S. *With Map.*

India—Burma. **Rigby.**

History of Operations in Northern Arakan and the Yawdwin Chin Hills, 1896–97, with a description of the Country and its Resources, Notes on the Tribes, and Diary. By Captain G. C. Rigby. Rangoon, 1897. Size 13½ × 9. *Maps and Illustrations.*

See *Journal* for May, vol. xi. (1898), p. 546.

India—Chitral. **Robertson.**

Chitrál, the Story of a Minor Siege. By Sir George S. Robertson, K.C.S.I. London: Methuen & Co., 1898. Size 9 × 6, pp. x. and 368. *Map and Illustrations. Price* 21*s. Presented by the Publishers.*

This is noticed in the *Journal* for December, 1898, vol. xii. p. 609.

India—Geological Survey. ——

General Report on the work carried on by the Geological Survey of India for the period from January 1, 1897, to April 1, 1898, under the direction of C. L. Griesbach. Calcutta, 1898. Size 10 × 7, pp. 80. *Presented by the Geological Survey of India.*

India—Kashmir. *Contemporary Rev.* **74** (1898): 872–881. **Bretherton.**

Life in Gilgit. By Captain G. H. Bretherton, D.S.O.

India—Ladak. *J. Manchester G.S.* **14** (1898): 1–23. **Shawe.**

Western Tibet. By F. B. Shawe. *With Illustrations.*

The author uses "Western Tibet," as distinguished from what he terms "Chinese Tibet," to designate the mountainous country of Ladak and Baltistan, and the paper deals exclusively with Ladak, where the author resided for some time.

India—Marine Survey. ——

Administration Report of the Marine Survey of India for the Official Year 1897–98. Bombay, 1898. Size 13 × 8½, pp. 12.

India—Tirah. **Holdich.**

Tirah. By Colonel Sir T. H. Holdich. (From the *Geographical Journal* for October, 1898.) Size 10 × 6½, pp. 24. *Map and Illustrations.*

Indo-China. *B.S.G. Com. Paris* **20** (1898): 530–534. **Massieu.**

De Mandalay à Huć. Par Mme. I. Massieu. *With Map.*

The route led across from Mandalay to the Mekong, down that river to Savanmakat, and thence straight across to Huć.

Japan. **Hall.**

Trade of Hiogo and Osaka for the year 1897. Foreign Office, Annual No. 2189, 1898. Size 10 × 6½, pp. 24. *Price* 1½*d.*

Japan. *J.G. Tokyo G.S.* **10** (1898): 496–502. **Jimbō.**

On the Place Names in Hokkaidō. By Kotora Jimbō. [In Japanese.]

Japan. *J.G. Tokyo G.S.* **10** (1898): 153–159. **Koiwai.**

A Trip around the Noto Peninsula. By Kaneteru Koiwai. [In Japanese.]

Japan. *J.G. Tokyo G.S.* **10** (1898): 183–194. **Suzuki.**

Ashio Copper Mine. By Toshi Suzuki. [In Japanese.]

Japan—Formosa. *T. Asiatic S. Japan* **24** (Suppl.) (1896): 1–118. **Henry.**
A List of Plants from Formosa, with some Preliminary Remarks on the Geography, Nature of the Flora, and Economic Botany of the Island. By Augustine Henry.

Japan—Formosa. *J.G. Tokyo G.S.* **10** (1898): 357–364, 437–444. **Ishii.**
Geology of the Vicinities of Giran, and Geological Explorations at Taihoku, Taishū, and Tainan, in Formosa. By Yamajirō Ishii. [In Japanese.]

Japan—Formosa. *Petermanns M.* **44** (1898): 222–226. **Schuhmacher.**
Formosa und seine Gebirgsbewohner. Von Rob. Schuhmacher.
A brilliant description of the lowlands of Formosa, passing in review the country, the people, and its products.

Japan—Formosa. *J.G. Tokyo G.S.* **10** (1898): 419–427. **Torii.**
Aboriginal Tribes in Formosa. By Tatsuzō Torii. [In Japanese.]

Japan—Kurile Islands. *J.G. Tokyo G.S.* **10** (1898): 128–150, 205–214. ———
Works of Hōkōgikwai in Shumshu, Kurile Islands. [In Japanese.]

AFRICA.

Abyssinia. *J.R. United Service I.* **42** (1898): 1271–1298. **Fedoroff.**
Abyssinia as a Factor to be considered both in the Re-Settlement of the Soudán and in the Future of the Red Sea. By V. Fedoroff. Translated from the Russian by Lieut.-Colonel W. E. Gowan.

Africa. **Sanderson.**
Africa in the Nineteenth Century. By Edgar Sanderson. London: Seeley & Co., 1898. Size 8½ × 6, pp. vi. and 336. *Map and Portraits. Price 5s. Presented by the Publishers.*

This is a history of European intervention in Africa during the present century, much of the space being devoted to Egypt and to South Africa, and the description of military operations receiving special attention.

British West Africa. *J. Manchester G.S.* **14** (1898): 190–207. **Leonard.**
Notes of a Journey to Bende. By Major Arthur Glyn Leonard.

Cape of Good Hope. ———
Statistical Register of the Colony of the Cape of Good Hope for the year 1897, with supplement for March Quarter, 1898. Cape Town, 1898. Size 13 × 8½, pp. xviii. and 376. *Diagram. Presented by the Colonial Secretary, Cape Town.*

Congo State. ———
Société Royale de Médecine publique et de Topographie médicale de Belgique. Congrès National d'Hygiène et de Climatologie médicale de la Belgique et du Congo, du 9 au 14 août 1897, au Palais des Académies. Seconde Partie, Congo (Climat, Constitution du Sol et Hygiène de l'État Indépendant). Bruxelles: Hayez, 1898. Size 10 × 7, pp. 243–890. *Diagrams and Illustrations. Presented by the Société Royale de Médicine Publique de Belgique.*

This contains very comprehensive statistics of the climate, including the meteorological observations at the chief stations in the Congo State.

Congo State. *Rev. Scientifique* **10** (1898): 559–562. ———
Les animaux domestiques de l'Etat indépendant du Congo (mammifères et oiseaux).

East Africa. *Globus* **74** (1898): 265–266. **Meyer.**
Ergebnisse meiner vierten ostafrikanischen Reise. Von Dr. Hans Meyer.

Egypt. *Nineteenth Century* **44** (1898): 881–914. ———
The Future of Egypt: (1) Our Hampered Trusteeship. By Edward Dicey, C.B. (2) The Niger and the Nile: a Warning. By Henry Birchenough. (3) Egypt and Tunis: a Study in International Law. By John Macdonell, LL.D.

Egypt. *Cosmos* **12** (1894–96): 225–238. **Schiaparelli.**
La configurazione geografica dell' Alto Egitto, in relazione collo svolgimento della sua antica civiltà. Note di E. Schiaparelli.

Egypt. **White.**
England and Egypt. By A. Silva White. From the *Forum*, March, 1898. Size 10 × 7, pp. 59–71.

Egypt—Natron Lakes. *Jahrb. Schweizer Alpenclub* **33** (1897–98): 216–237. **Zeller.**
Ein Ausflug zu den Natronseen in der lybischen Wüste. Von Dr. Rudolf Zeller. *With Plate.*

A visit to the Wadi Natron in 1896. A coloured view of the Coptic monastery is given.

Egyptian Sudan. ———
Egypt. No. 2 (1898). Correspondence with the French Government respecting the Valley of the Upper Nile. London: Eyre & Spottiswoode, 1898. Size 13½ × 8½, pp. iv. and 22. *Price* 3*d.*

Egyptian Sudan. *Nineteenth Century* **44** (1898): 1048–1054. **Maurice.**
Omdurman. By Major-General Frederick Maurice.

Egyptian Sudan. **Steevens.**
With Kitchener to Khartum. By G. W. Steevens. Second Edition. Edinburgh and London: W. Blackwood & Sons, 1898. Size 8 × 5½, pp. xiv. and 326. *Map and Plans. Price* 6*s. Presented by the Publishers.*

This is a remarkably vivid description of the incidents of the advance on Khartum, and incidentally of the characteristics of the portion of the Egyptian Sudan lying north of the capital. Mr. Steevens often succeeds by a phrase in giving an impression of the nature of the country more vivid than pages of detailed description could produce.

Egyptian Sudan—Bahr-el-Ghazal. *Mouvement G.* **15** (1898): 535–538. ———
La mission Marchand dans le Bahr-el-Gazal.

A sketch of the progress of Marchand's journey from Brazzaville, which he left on March 1, 1897, to the Nile.

Egyptian Sudan—Bahr-el-Ghazal. *Questions Dipl. et Colon* **5** (1898): 165–171. **Pensa.**
La France au Bahr-el-Ghazal. Par Henri Pensa.

Egyptian Sudan—Bahr-el-Ghazal. *Fortnightly Rev.* **64** (1898): 849–863. **Wills.**
New Light on the Bahr-Gazal Frontier. By J. T. Wills. *With Map.*

Egyptian Sudan—Fashoda. *Questions Dipl. et Colon.* **5** (1898): 203–207. **Couronnel.**
Le "Blue Book" du Government Anglais sur Fachoda. Par M. le Comte de Couronnel.

Egyptian Sudan—Fashoda. *Fortnightly Rev.* **64** (1898): 665–676. **Decle.**
The Fashoda Question. By Lionel Decle. *With Map.*

French Sudan—Timbuktu. *Tour du Monde* **4** (1898): 409–432. **Réjou.**
Huit mois à Tombouctou et dans la région nord. Par M. le Commandant Réjou. *With Illustrations.*

French West Africa—Dakar. *B. Union G. Nord de la France* **19** (1897): 45–56. **Terquem.**
Le Port de Dakar. Par M. Henri Terquem.

This description of Dakar is compiled from the notes of a traveller who had visited the west coast of Africa on several occasions, and resided there.

French West Africa—Ivory Coast. *B.S. Languedoc. G.* **21** (1898): 60–66. **Eyssèric.**
Voyage d'exploration à la Côte d'Ivoire. Par M. Eyssèric. *With Map.*

French West Africa—Ivory Coast. **Westphal.**
B.S. Languedoc. G. **21** (1898): 11–29, 217–226.
La Côte d'Ivoire, son avenir industriel et commercial. Par M. Gustave Westphal.

German East Africa. *Deutsches Kolonialblatt* **9** (1898): 618–621. **Liebert.**
Bericht des Kaiserlichen Gouverneurs General-Majors Liebert über seine Reise nach Usagara und Uluguru.

German East Africa. *Verh. Ges. Erdk. Berlin* **25** (1898): 303–323. **Ramsay.**
Herr Hauptmann Ramsay: Ueber seine Expeditionen nach Ruanda und dem Rikwa-See.

German East Africa—Dar-es-Salaam. **Seidel.**
Dar-es-Salaam, die Hauptstadt Deutschostafrikas. Ein Kulturbild von A. Seidel. Berlin: Messer, Mensser & Co., 1898. Size 9½ × 6½, pp. 46. *Illustrations. Presented by the Author.*

Dar-es-Salaam has won the reputation of being the most handsomely built town in tropical Africa, and the description of its history and photographs of its public buildings here published are highly creditable to German colonial enterprise.

German South-West Africa. *Globus* **74** (1898): 249–251. **Gessert.**
Reise von Bethanien nach Garis im Namaland (Deutsch-S.W.-Afrika). Von Ferdinand Gessert.

German West Africa. *M. Deutsch. Schutzgebieten* **11** (1898): 183–186. **Besser.**
Bericht des Premierlieutenants v. Besser über seine Bereisung des Ndiangebietes im Jahre 1895.
A journey from the Rio del Rey to Cross river, on the German side of the boundary.

German West Africa—Kamerun. *Deutsches Kolonialblatt* **9** (1898): 498–504. ——
Bericht über die Bane-Bule-Expedition.

German West Africa—Kamerun. *M. Deutsch Schutzgebieten* **11** (1898): 208–211. ——
Die Höhe des Gipfels des Kamerungebirges.
A note on this paper was given in the *Journal* for November, p. 525.

German West Africa—Kamerun. *M. Deutsch. Schutzgebieten* **11** (1898): 194–204. **Conrau.**
Einige Beiträge über die Völker zwischen Mpundu und Bali. Von G. Conrau.

German West Africa—Kamerun. *M. Deutsch. Schutzgebieten* **11** (1898): 204–208. **Conrau.**
Von Mundame nach dem Berge Diungo. Von G. Conrau.

German West Africa—Kamerun. *M. Deutsch. Schutzgebieten* **11** (1898): 186–190. **Schnauder.**
Astronomische Ortsbestimmungen in Kamerun. Von M. Schnauder.

Indian Ocean. ——
Supplement, 1898, relating to Islands in the Southern Indian Ocean, westward of longitude 80° East, including Madagascar. 1891. Corrected to August, 1898. London: J. D. Potter, 1898. Size 10 × 6½, pp. 80. *Price* 9*d*. *Presented by the Admiralty.*

Madagascar. *C. Rd.* **127** (1898): 708–711. **Colin.**
Levés géodésiques, astronomiques et magnétiques à Madagascar. Note du P. Colin.
Describes the geodetic surveys carried out in Madagascar since 1896, and gives a certain number of positions fixed by astronomical observations.

Madeira. *Blackwood's Mag.* **164** (1898): 550–557. **Owen.**
Madeira Waterways. By Rye Owen.
A picturesque description of Madeira and the system of irrigation employed in the island.

Natal—Zululand. **Garrard.**
Report on the Mining Industry of Zululand, for the year 1897. By J. Jervis Garrard. Pietermaritzburg, 1898. Size 13 × 8½, pp. 70. *Sections. Presented by the Commissioner of Mines, Zululand.*
Describes in detail, with sections, the results of the year's prospecting for gold and coal in Zululand.

Portuguese East Africa—Delagoa Bay. *Globus* **74** (1898): 185–193. **Seidel.**
Die Ba-Ronga an der Delagoabai. Nach den Forschungen des Schweizer Missionars Junod geschildert von H. Seidel. *With Illustrations.*

Sahara. *Rev. Scientifique* **10** (1898): 230–234. **Dex.**
Peut-on et doit-on traverser le Sahara central en ballon? Par M. Léo Dex.

Sahara—Ghat and Aïr. **Schirmer.**
Le dernier rapport d'un Européen sur Ghât et les Touareg de l'Aïr (Journal de Voyage d'Erwin de Bary, 1876–1877) Traduit et annoté par Henri Schirmer. Paris: Librairie Fischbacher, 1898. Size 9 × 6, pp. 222. *Presented by Prof. Henri Schirmer.*
The translation of the journal kept by the German traveller, de Bary.

Sahara—Vegetation. *Naturw. Wochenschrift* **13** (1898): 517–520. **Schneider.**
Aus der Pflanzenwelt der Sahara. Von Camillo Karl Schneider.
A compilation from the works of explorers.

St. Helena. *A travers le Monde, Tour du Monde* **4** (1898): 297–300. **Lorin.**
A Sainte-Hélène. Par M. Henri Lorin. *With Illustrations.*
A visit to St. Helena by a special correspondent for the opening of the Congo railway.

St. Helena. **Sterndale.**

St. Helena. Annual Report for 1897. Colonial Reports, Annual No. 240, 1898. Size 10 × 6½, pp. 10. *Price* 1*d.*

South Africa. *Blackwood's Mag.* **164** (1898): 739–759. **Lawley.**

From Bulawayo to the Victoria Falls: a Mission to King Lewanika. By Captain the Hon. Arthur Lawley.

Spanish West Africa. *B.S.G. Madrid* (1898): 217–228. **Labra.**

La Guinea española y los problemas africanos. Según D. Rafael María de Labra.

NORTH AMERICA.

Canada—British Columbia. ——

The British Columbia Pilot, Second Edition, including the Coast of British Columbia from Juan de Fuca Strait to Portland Canal, together with Vancouver and Queen Charlotte Islands. London: J. D. Potter, 1898. Size 9½ × 6½, pp. xx. and 598. *Index Chart. Price* 5*s.* 6*d. Presented by the Admiralty.*

Canada—Yukon District. *Fortnightly Rev.* **64** (1898): 745–755. **Down.**

Adventurers at the Klondike. By T. C. Down.

Mexico. *B. Observatorio Astron. Nac. Tacubaya* **2** (1898): 135–141. **Puga.**

Posiciones geográficas determinadas con triangulación topográfica por la Comisión hidrográfica del Ayuntamiento de México.—1897–1898. Bajo la dirección del Ingeniero Geógrafo Guillermo. Por Puga.

Mexico. **Carden.**

Trade of Mexico and Tampico for the year 1897. Foreign Office, Annual No. 2184, 1898. Size 9½ × 6, pp. 18. *Price* 1½*d.*

Mexico. **Lummis.**

The Awakening of a Nation. Mexico of To-day. By Charles F. Lummis. New York and London: Harper & Brothers, 1898. Size 8½ × 5½, pp. xii. and 180. *Map and Illustrations. Price* 10*s.* 6*d.*

Glimpses of life in modern Mexico.

Mexico. **Romero.**

Geographical and Statistical Notes on Mexico. By Matias Romero. New York and London: G. P. Putnam's Sons, 1898. Size 10 × 6½, pp. xiv. and 286. *Presented by Señor Enrique J. Gonzalez.*

Mexico—Lower California. **Merrill.**

Notes on the Geology and Natural History of the Peninsula of Lower California. By George P. Merrill.—Report of the U.S. National Museum, 1895. Washington, 1897. Pp. 969–994. *Map and Illustrations.*

Mexico—Yucatan. **Thompson.**

Ruins of Xkichmook, Yucatan. By Edward H. Thompson. (Field Columbian Museum, Publication 28. Anthropological Series, vol. ii. No. 3.) Chicago, 1898: Size 10 × 6½, pp. 213–230. *Plans and Illustrations.*

An account of the detailed study of ruins discovered by the author in 1886 and fully worked out in 1896. The name he suggests is properly Xkichmul, a word meaning "between the hills," which corresponds with the position of the ruins.

North America—Historical. *Blackwood's Mag.* **164** (1898): 495–508. ——

Romance of the Fur Trade: the Companies.

North America—Tides. *National G. Mag.* **9** (1898): 400–409. **Jefferson.**

Atlantic Estuarine Tides. By Mark S. W. Jefferson. *With Diagrams.*

United States. *National G. Mag.* **9** (1898): 387–400. **Goode.**

Bitter Root Forest Reserve. By Richard U. Goode. *With Map and Illustrations.*

United States. **O'Beirne.**

Cattle Industry of the United States for two years ending June, 1898. Foreign Office, Miscellaneous, No. 481, 1898. Size 10 × 6½, pp. 26. *Price* 2*d.*

United States. ——

Annual Report of the Secretary of the Interior for the Fiscal Year ended June 30, 1896. 5 vols. [in 9]. Washington, 1896–97. Size (vols. i.–iii. and v. [2 parts]), 9½ × 6½; vol. iv. [4 parts], 12 × 8, pp. (vol. i.) clvi. and 494; (vol. ii.) 972; (vol. iii.) 776; (vol. iv., part 1) xxii. and 1076; (part 2) xxvi. and 864; (part 3)

xxii. and 1058; (vol. v., 2 parts) lxxvi. and 2174. *Maps and Illustrations. Presented by the U.S. Government.*

The articles of geographical interest in these volumes are entered separately. Vol. ii. contains a map of the Indian reservations in the United States.

CENTRAL AND SOUTH AMERICA.

Argentine Republic—Aconcagua. **Fitz Gerald.**

Exploration on and around Aconcagua. By E. A. Fitz Gerald. From the *Geographical Journal* for November, 1898. Size 10 × 6½, pp. 26. *Map and Illustrations.*

Brazil. *Globus* **74** (1898): 121–124. **Steinen.**

Coudreaus Schingúreise. Von Karl v. d. Steinen.

Brazil. **Thompson.**

Brazil: its Commerce and Resources. By the Hon. T. L. Thompson. From the *Forum*, March, 1898. Size 10 × 7, pp. 46–58.

Central America. *Z. Ges. Erdk. Berlin* **33** (1898): 254–282. **Valentini.**

Pinzon-Solis. 1508. Von Ph. J. J. Valentini. *With Map.*

Cuba. *Fortnightly Rev.* **64** (1898): 507–526, 715–725. **Ramsden.**

A Diary at Santiago. By Frederick W. Ramsden. *With Map.*

Falkland Islands. **Craigie-Halkett.**

Falkland Islands. Annual Report for 1897. Colonial Reports, Annual No. 235, 1898. Size 10 × 6½, pp. 30. *Price* 2*d.*

French Guiana. *Rev. G.* **43** (1898): 161–179. **Froidevaux.**

Une visite aux îles du Salut (les îles au Diable) en 1763. Par M. H. Froidevaux. *With Map and Illustration.*

Honduras. *Verh. Ges. Erdk. Berlin* **25** (1898): 328–330. **Sapper.**

Herr Dr. Carl Sapper: Ueber seine Reise in Honduras.

Jamaica. **Stark.**

Stark's Jamaica Guide (Illustrated) containing a description of everything relating to Jamaica of which the Visitor or Resident may desire information, including its History, Inhabitants, Government, Resources, and places of interest to Travellers. By James H. Stark. Boston & London: Low & Co., [1898]. Size 8 × 5½, pp. viii. and 208. *Maps and Illustrations. Price* 6*s.*

Nicaragua Canal. *Engineering Mag.* **15** (1898): 720–726. **Nimmo.**

The Nicaragua Canal in its Commercial and Military Aspects. By Joseph Nimmo, jr.

Paraguay. *Travel* **3** (1898): 222-228. **Hastings.**

To the Paraguayan Utopia. By the Rev. Fredk. Hastings. *With Illustrations.*

Patagonia. **Steffen.**

Informe sumario acerca del trascurso i resultados jenerales de la espedicion exploradora del rio Cisnes (en la Patagonia occidental). Por Dr. Juan Steffen. Santiago de Chile, 1898. Size 10 × 7½, pp. 30. *Map and Illustrations. Presented by the Author.*

A note on this paper appears in the *Journal* for December, 1898, vol. xii. p. 615.

Peru. *B.S.G. Lima* **7** (1897): 241–310. **Raimondi.**

Geografia fisica: Islas, islotes y rocas del Perú: Bahias y Puntas (de los manuscritos del señor Raimondi).

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Place-Names. *T.R.G.S. Australasia* (*Victoria*) **15** (1898): 33–47. **Wright.**

The Nomenclature of an Australian Colony. By A. J. Wright.

Australia. *G.Z.* **4** (1898): 508–520. **Jung.**

Die wirtschaftlichen Verhältnisse der australischen Kolonien. Von Dr. Emil Jung.

British New Guinea. *T.R.G.S. Australasia (Victoria)* **15** (1898): 12–15. **Bevan.**

The Discovery of the Aird and Purari Rivers. (Gulf of Papua, British New Guinea.) By Theodore F. Bevan. *With Map.*

British New Guinea. *T.R.G.S. Australasia (Victoria)* **15** (1898): 16–23. **Bevan.**

The Gold Rush to British New Guinea. By Theodore F. Bevan.

British New Guinea. **Macgregor.**

Despatch from His Excellency the Lieutenant-Governor of British New Guinea, reporting Visit of Inspection to Western Districts of the Possession. No. 20. 1898. Size 13¾ × 9, pp. 4. *Presented by the Colonial Office.*

Dutch New Guinea. *Petermanns M.* **44** (1898): 232–235. **Vráz.**

Reise nach Neu-Guinea. Von E. St. Vráz.

Hawaii. **Krout.**

Hawaii and a Revolution. The personal experiences of a Newspaper Correspondent in the Sandwich Islands during the crisis of 1893 and subsequently. By Mary H. Krout. London: John Murray, 1898. Size 8½ × 5½, pp. xiv. and 332. *Illustrations. Price* 10*s.* 6*d. Presented by the Publisher.*

An informal history of the rise of the Hawaiian Republic, with descriptions of life in Honolulu, interviews with the last of the royal family, a visit to the famous volcano of Kilauea, and a sketch of the new constitution and of the resources of the country.

Hawaii. *B. American G.S.* **30** (1898): 277–280. **Littlehales.**

The United States Mid-Pacific Naval Supply Station. By G. W. Littlehales. *With Charts.*

The United States naval station, ceded by the King of Hawaii in 1884, is situated in the curious inlets of the island of Oahu, known as the Pearl Lochs, which are here described.

Hawaii. **Morgan.**

The Duty of annexing Hawaii. By John T. Morgan. From the *Forum*, March, 1898. Size 10 × 7, pp. 11–16.

New Guinea, etc. **Cayley-Webster.**

Through New Guinea and the Cannibal Countries. By H. Cayley-Webster. London: T. Fisher Unwin, 1898. Size 9½ × 6½, pp. xviii. and 388. *Portrait, Map, and Illustrations. Price* 21*s. Presented by the Publisher.*

POLAR REGIONS.

Antarctic.

The *Scottish Geographical Magazine.* Vol. xiv. No. 10, October, 1898. Special Antarctic Number. *With Map and Portrait.*

This number contains "A plea for a British Antarctic Expedition," by Sir John Murray; republishes the paper and discussion at the Royal Society's special Antarctic meeting; and gives a "History of Antarctic Discovery," by Mr. W. A. Taylor; an account of "The Fauna and Flora of the Antarctic," by Mr. James Chumley; and an "Antarctic Bibliography," by Mr. J. G. Bartholomew.

Arctic. *Cosmos* **12** (1894–96): 239–258. **Ryder.**

Condizioni dei ghiacci nel Mar di Groenlandia ed adiacenze, 1877-1892. Per Carlo Ryder. *With Maps.*

Arctic—Franz Josef Land. **Kœttlitz, Newton, and Teall.**

Quarterly J. Geolog. S. **54** (1898): 620–652.

Observations on the Geology of Franz Josef Land. By Dr. Reginald Kœttlitz. *With Diagrams.*

Additional Notes on Rocks and Fossils from Franz Josef Land. By E. T. Newton and J. J. H. Teall. *With Plate.*

Arctic—Jan Mayen. *G. Tidskrift* **14** (1898): 159–165. **Ostenfeld.**

En Nat paa Jan-Mayen. Af C. Ostenfeld. *With Map and Illustrations.*

On the visit of the *Ingolf* to Jan Mayen in 1896.

Greenland. *G. Tidskrift* **14** (1898): 169–172. **Ryberg.**

Frå Missions og Handelsstationen ved Angmagssalik. Af Carl Ryberg.

Greenland. *P. Literary and Philosoph. S. Liverpool* **52** (1898): 119–153. **Sephton.**

What the Sagas say of Greenland. By Rev. John Sephton, M.A.

Norwegian Arctic Expedition. *B.S.G. Com. Bordeaux* **21** (1898): 360–364. **Voll.**

La nouvelle expédition polaire norvégienne. Par Nils Voll.

An account of the equipment and crew of the *Fram* for the expedition to Northern Greenland on which Captain Sverdrup is now engaged.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Land Forms. *J. School G.* **2** (1898): 340–345. **Davis.**

The Selection of Topographical Maps for Schools. By W. M. Davis.

A list of topographical map-sheets of the U.S. Geological Survey, showing typical land forms and varieties of scenery.

Land Forms. *J. Geology* **6** (1898): 589–596. **Fairchild.**

Kettles in Glacial Lake Deltas. By H. L. Fairchild. *With Illustrations.*

After describing a large depression in a glacial delta at Potter, N.Y., the author points out that such basins may be produced either by the melting of a great block of buried ice, or by circumdeposition, and he proposes criteria for distinguishing between the two.

Land Forms. **Tarr.**

Wave-formed Cuspate Forelands. By Ralph S. Tarr. From the *American Geologist*, vol. xxii., July, 1898. Size 9¼ × 6½, pp. 12. *Illustrations. Presented by the Author.*

Prof. Tarr, in demonstrating that some cuspate forelands are produced by wave-action, considers that it would be well to prove that the other causes which have been assigned for the production of these forms are really sufficient to produce the effects claimed for them.

Land Forms. **Tarr.**

The Peneplain. By Ralph S. Tarr. From the *American Geologist*, vol. xxi., June, 1898. Size 9¼ × 6½, pp. 351–370.

The author joins issue directly with Prof. Davis as to the interpretation of the scenery which has led the latter to put forward his generalization of the action of river-erosion in reducing a region to the condition of a peneplain.

Meteorology. *Ann. Hydrographie* **26** (1898): 443–451. ——

Orkanartiger Sturm bei Kap Horn am 20 bis 22 April 1896. *With Diagrams.*

Meteorology. *Jahrb. Schweizer Alpenclub* **33** (1897–98): 292–300. **Bosshard.**

Elmsfeuer und Blitzgefahr im Gebirge. Von Dr. E. Bosshard. *With Plate.*

On the electric phenomena of high mountains, especially St. Elmo's fire and lightning.

Meteorology. *Ann. Hydrographie* **26** (1898): 451–462. **Haltermann.**

Einige Angaben über die im Spätherbst und Winter Südöstlich von den Azoren auftretenden Tiefdruckgebiete und deren Bedeutung für die Schiffahrt. Von Herm. Haltermann.

Meteorology—Upper Atmosphere. **Hann.**

Ueber die Temperatur des Obirgipfels (2140 m.) und des Sonnblickgipfels (3106 m.). Von J. Hann. Aus den Sitzungsberichten der kaiserlichen. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe, Bd. cvii. Abth. ii. a. Mai 1898. Wien, 1898. Size 10 × 6½, pp. 32. *Presented by the Author.*

At the observatory on the summit of the Sonnblick, in 47° 3′ N., and 10,190 feet above the sea, the mean annual temperature for eleven years was 26° Fahr., that of the coldest months (January and February), 6°·5 Fahr., and of the warmest (July), 33°·8. The highest temperature ever recorded on the summit was 55°·5, and the lowest − 30°·3.

Meteorology—Upper Atmosphere. **Riccò and Saya.**

Atti R.A. Lincei, Rendiconti **7** (1898): 103–111.

Osservazioni meteorologiche orarie simultanee, in quattro stazioni da Catania alla cima dell' Etna. Nota del A. Riccò e di G. Saya. *Diagrams.*

Hourly observations of the various meteorological data at four stations from sea-level to the summit of Mount Etna, for periods exceeding twenty-four hours on two occasions, July, 1897, and March, 1898.

Meteorology—Wind. **Hegyfoky.**

Mathemat. u. Naturw. Berichte Ungarn **14** (1898): 197–213.

Die unteren und oberen Luftströmungen über der ungarischen Tiefebene. Von J. Hegyfoky.

Observations on upper and lower cloud-movements in the great plain of Hungary, serving as indexes of the movements of the upper and lower strata of the atmosphere.

Ocean Currents. *B.S.G. Lima* **7** (1897): 311–314. **Balta.**

Un efecto geodinámico de la corriente antártica Americana. Por el ingeniero José Balta. *With Map.*

Oceanic Life. *Ann. Hydrographie* **26** (1898): 302–311. **Haltermann.**

Ueber gelbe Wasserblüthe des Meeres. (Trichodesmium.) Von H. Haltermann. *With Chart.*

A collection of instances in which yellow discolorations of the sea due to plankton were observed by the captains of German vessels.

Oceanic Noises. **Kain and others.**

Seismic and Oceanic Noises. By Samuel W. Kain and others. (Reprinted from the *Monthly Weather Review* for April, 1898.) Size 9 × 6½, pp. 6.

This is a contribution to our information regarding the unexplained noises known as *mistpoeffers, barisal guns*, etc., and suggests several possible explanations.

Oceanographical Methods. *Ann. Hydrographie* **26** (1898): 312–323. **Pettersson.**

Zur Methodik der hydrographischen Forschung. Von O. Pettersson.

Oceanography. *C. Rd.* **127** (1898): 731–733. **Boutan.**

L'instantané dans la Photographie sous-marine. Note de M. Louis Boutan.

On the methods of obtaining instantaneous submarine photographs.

Oceanography. *G. Tidskrift* **14** (1898): 151–159. **Knudsen.**

Ingolf-Expeditionens hydrografiske Undersøgelser. Af cand. mag. Martin Knudsen. *With Map.*

Oceanography. *Ann. Hydrographie* **26** (1898): 356–359. **Köppen.**

Jahres- Isothermen und -Isanomalen der Meeresoberfläche. Von W. Köppen. *With Chart.* [Also in *Globus* 74 (1898): 233–235. *With Chart.*]

On the temperature of the surface water of the ocean.

Oceanography. **Murray.**

On the Annual Range of Temperature in the Surface Waters of the Ocean, and its relation to other Oceanographical Phenomena. By Sir John Murray, K.C.B. (From the *Geographical Journal* for August, 1898.) Size 10 × 6½, pp. 26. *Chart.*

Oceanography. *Die Natur* **47** (1898): 427–429. **Zacharias.**

Die ozeanographischen Aufgaben der deutschen Tiefsee-Expedition. Von Otto Zacharias.

Preliminary results of the voyage of the *Valdivia*.

Oceanography—Red Sea. *Sitz. k. A. W. Wien* **106**, Abth. I. (1897): 407–424. **Steuer.**

Vorläufiger Bericht über die pelagische Thierwelt des Rothen Meeres. Von Dr. Adolf Steuer. *With Map.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Brinton.**

The Factors of Heredity and Environment in Man. By Daniel G. Brinton, M.D. Reprinted from the *American Anthropologist*, September, 1898. Washington, 1898. Size 10 × 6½, pp. [8]. *Presented by the Author.*

Commercial Geography. *B. American G.S.* **30** (1898): 281–304. **Sears.**

Geographic conditions that make great Commercial Centres. By Major A. F. Sears.

The growth of cities in America is considered in the light of the various geographical conditions.

Commercial Geography—Coal Tables. ———

Copy "of Statement showing the Production and Consumption of Coal, and the Number of Persons employed in Coal Production, in the Principal Countries of

the World, in each year from 1883 to 1896, as far as the Particulars can be stated; together with a Statement showing the Production of Petroleum in the United States and in the Russian Empire for a series of years (in continuation of Parliamentary Paper No. 1, of Session 1897)." London: Eyre & Spottiswoode, 1898. Size 13 × 8½, pp. 54. *Price* 5½*d.*

Commercial Geography—Drugs. ——

Special Consular Reports. The Drug Trade in Foreign Countries. Vol. xiv. Reports from the Consuls of the United States. Issued from the Bureau of Foreign Commerce, Department of State. Washington, 1898. Size 9½ × 6, pp. 418.

Historical. **Gaffarel.**

Rev. G. **42** (1898): 54, 145, 463; **43** (1898): 58, 117, 219, 307, 381.

De orbe novo. Par Pierre Martyr d'Anghiera. Quatrième décade, traduite, avec notes et commentaires. Par Paul Gaffarel.

Historical—Portuguese Navigators. **Viterbo.**

Trabalhos Nauticos dos Portuguezes nos seculos xvi. e xvii. Parte i. Marinharia. Memoria apresentada á Academia Real das Sciencias por occasião da celebração do 4°. Centenario do Descobrimento do caminho maritimo da India. Por Lousa Viterbo. Lisboa, 1898. Size 12 × 9, pp. 342. *Presented by the Author.*

Historical—Zeni. **Lucas.**

The Annals of the Voyages of the Brothers Nicolò and Antonio Zeno in the North Atlantic about the end of the Fourteenth Century, and the Claim founded thereon to a Venetian Discovery of America. A Criticism and an Indictment. By Fred. W. Lucas. Illustrated by Facsimiles. London: H. Stevens, Son & Stiles, 1898. Size 14 × 10½, pp. xiv. and 234. *Price* £2 2*s.* *Presented by the Publishers.*

This superb volume deals first with "the Story of the Book" of the voyages of the brothers Zeni, then with "the Story in the Book," and finally there are a Summary and Conclusions. The text is profusely illustrated with reproductions of ancient maps and quaint engravings. The appendices contain beautiful facsimiles of the Italian and English editions of the voyages, a bibliography, and a large number of reproductions of valuable old maps.

Political Geography. *G.Z.* **4** (1898): 397–408, 455–465, 520–525. **Hertzberg.**

Friedrich Ratzel's politische Geographie. Von Dr. Heinrich Hertzberg.

BIOGRAPHY.

Bolivar. *B.S.G. Com. Bordeaux* **21** (1898): 337–352. **Vincent and Humbert.**

Simon Bolivar; sa vie, son œuvre (1783–1830). Par le Dr. L. Vincent et J. Humbert.

A sketch of the life of the Liberator of South America.

Fitz Gerald. *Travel* **3** (1898): 338–339. ——

Mr. E. A. Fitz Gerald. *With Portrait.*

Giles. *T.R.G.S. Australasia* (*Victoria*) **15** (1898): 96–99. ——

Mr. Ernest Giles.

Gümbel. *Deutsche Rundschau G.* **20** (1898): 572–573. ——

Karl Wilhelm v. Gümbel. *With Portrait.*

Dr. von Gümbel (1823–1898) was engaged largely in the study of the Alps from the point of view of geognosy.

Kerner. *Deutsche Rundschau G.* **21** (1898): 85–88. ——

Anton Kerner R. v. Marilaun. *With Portrait.*

Kiepert. *Deutsche Rundschau G.* **20** (1898): 569–571. ——

Heinrich Kiepert. Zu seiner achtzigsten Geburtstagsfeier. *With Portrait.*

Lista. *Deutsche Rundschau G.* **21** (1898): 42–43. **Greger.**

Ramon Lista. Von J. Greger. *With Portrait.*

Mason Bey. *B.S. Khédiv. G.* **5** (1893): 61–66. **Abbate.**

Mason Bey. Par le Dr. Abbate Pacha.

Colonel Alexander Macomt Mason, who died in March, 1897, was an American, who entered the Egyptian army and carried out many surveys in the Sudan.

Michelet. **Drapeyron.**

Comment Michelet est devenu historien et géographe. Conférence faite le 12 juillet 1898 à mes élèves du Lycée Charlemagne pour son centenaire (21 Août). Par Ludovic Drapeyron. Extrait de la *Revue de Géographie* (Livraisons de Septembre et d'Octobre 43 (1898), 188–201, 264–276). Paris: C. Delagrave, 1898. Size 10 × 7, pp. 32. *Presented by the Author.*

Pilkington. **Harford-Battersby.**

Pilkington of Uganda. By Charles F. Harford-Battersby, M.A., M.D. With an Introductory Chapter by Rev. J. H. Skrine, M.A. London: Marshall Bros. [1898]. Size 9 × 6, pp. xvi. and 346. *Portraits, Maps, and Plan. Presented by the Author.*

The life of one of the many brave missionary leaders in Uganda, including an important chapter in the history of missionary effort in Uganda, and a worthy sequel to the life of the pioneer Mackay.

GENERAL.

Ballooning. *Contemporary Rev.* **74** (1898): 851–863. **Bacon.**

Scientific Ballooning. By the Rev. John M. Bacon.

Ballooning. *B.A. Imp. Sci. St. Petersbourg* **7** (1897): 383–396. **Stelling.**

Die dritte internationale Ballonfahrt am 1 (13) Mai 1897. Die Resultate der Beobachtungen auf den Ballons "General Wannowskij" und "Kobtschik" des Luftschifferparks in St. Petersburg. Von Ed. Stelling.

British Empire. *Imperial I. J.* **4** (1898): 260. ——

Imperial Cable communications; with Map of the World's Telegraphic System.

Educational—Methods. *Petermanns M.* **44** (1898): 227–229. ——

Der geographische Unterricht an den deutschen Hochschulen im Wintersemester 1898-99.

This list contains a list of the courses of lectures in geography, and the various departments of physical geography in 28 universities and colleges in Germany, 7 in Austria, and 4 in Switzerland for the present winter Semester. Altogether 265 courses by 167 professors or lecturers are recorded—a striking proof of the vast educational value of Geography in the opinion of German-speaking people.

Educational—Methods. *G.Z.* **4** (1898): 617–643. **Krug.**

Die Geographie in der höheren Mädchenschule. Von M. Krug.

On the syllabus for Geography in the Prussian Girl's Schools.

Educational—Methods. *J.G. Tokyo G.S.* **10** (1898): 381–395. **Matsushima.**

On the Items of Teaching of Geography in Ordinary Middle Schools. By Takeshi Matsushima. [In Japanese.]

French Geographical Congress. *Rev. G.* **43** (1898): 362–368. **Gaffarel.**

Congrès de Géographie de Marseille. Par M. Paul Gaffarel.

Geographical Names. *J. School G.* **2** (1898): 336–340. ——

The Spelling of some Common Geographical Names.

These names are selected from the lists published by the United States Board of Geographic Names for the official use of the Government Departments in the United States. They are in nearly all cases in strict accordance with the R.G.S. system.

Geography. *J. G. Tokyo G.S.* **10** (1898): 266–272. **Iwasaki.**

The Relation between Geology and Physical and Political Geography. By Chōzō Iwasaki. [In Japanese.]

Geography as a Science. *J. School G.* **2** (1898): 328–336. **Dodge.**

The Social Function of Geography. By R. E. Dodge.

This is a portion of an interesting discussion on the theory of Geography, especially with regard to the geographical and social aspects of human environment.

Geology in Education. **Lobley.**

The Place of Geology in Education. By Prof. J. Logan Lobley. Extracted from the *Proceedings* of the South-Eastern Union of Scientific Societies for 1898. Size 9 × 6, pp. 54–64. *Presented by the Author.*

Haydn's Dictionary of Dates. **Vincent.**

Haydn's Dictionary of Dates and Universal Information relating to all ages and nations. Twenty-second Edition, containing the History of the World to the Autumn of 1898. By Benjamin Vincent. London: Ward, Lock & Co., 1898. Size 9½ × 6½, pp. vi. and 1290.

India and Egypt. *Nineteenth Century* **44** (1898): 1041–1047. **Oppenheim.**

The Tirah and Khartoum Expeditions. By L. Oppenheim.

Italian Geographical Congress. *Rev. G. Italiana* **5** (1898): 233–258, 341–364. **Frescura.**

I lavori del Terzo Congresso Geografico Italiano del prof. Bernardino Frescura.

Language of Gipseys. *Abh. Deutschen Morgenländ Ges.* **11** (1898): 1–128. **Sowa.**

Wörterbuch des Dialekts der deutschen Zigeuner, zusammengestellt von Rudolf v. Sowa.

Two separate vocabularies are given, one of the Western, the other of the Eastern, dialect of the German Gipseys.

Mariner's Compass. *C. Rd.* **127** (1898): 443–444. **Ravier.**

Sur une théorie géométrique des compas de marine. Mémoire de M. S. L. Ravier.

Ocean Routes. *Ann. Hydrographie* **26** (1898): 362–376. **König.**

Beitrag zur Kenntniss der Windverhältnisse auf der Segelroute von der Linie bis Kap Horn. Von Dr. H. König.

NEW MAPS.

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6, 9, 11, 13, 15, 16; XLVI. 2, 4; XLVII. 2, 3, 10, 12; XLIX. 7; L. 4; LIII. 6, 8, 10, 11, 16; LVI. 2, 3, 4; LVII. 1, 2. **Staffordshire**, I. 12. **Surrey** (this county is now complete). **Sussex**, XIX. 10, 11, 13, 15; XXX. 2, 3, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16; XXXI. 1, 5, 6, 10; XXXII. 5, 9, 10; XLIII. 3, 4, 7, 8; XLIV. 1, 2, 3, 4, 5, 6, 7, 10; XLV. 1, 2, 5, 6, 12; XLVI. 6. **Westmorland**, IX. 16; XIV. 8, 12, 16; XV. 8, 9, 10, 11, 12, 13, 14, 15, 16; XVI. 1, 2, 5, 6, 7, 10, 11, 12, 13, 14; XVII. 9, 13, 14; XXIII. 1, 3, 4, 6, 7, 9, 15; XXIV. 1. *3s. each.*

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Turkey. **Goltz-Pascha.**

Karte der Umgegend von Constantinopel. Von C. Freiherr von der Goltz-Pascha. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Schall & Grund, Berlin, 1897. *Price* 4 *marks.*

ASIA.

China. **Bretschneider.**

Bretschneider's map of China: Supplementary maps.—1. Part of Northern Chile. Scale 1 : 755,000 or 10·3 stat. miles to an inch.—2. The mountains west of Peking. Scale 1 : 317,500 or 5·01 stat. miles to an inch.—3. Mid-China and the Yangtze river, in two sheets. Scale 1 : 2,050,000 or 32·3 stat. miles to an inch.—4. The great rivers of the Canton province. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch.—5. Parts of Yunnan province. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. By A. Bretschneider. Engraved and printed by A. Iliin, St. Petersburg, 1898. *Presented by the Author.*

This is a series of maps supplementary to Bretschneider's four-sheet map of China. They are all drawn on different enlarged scales, suitable to the area shown on the sheet, and include some of the most important parts of the Chinese empire, among which the map of the Yangtse valley, on two sheets, has a special interest at the present time. It would have been an advantage if more altitudes had been given.

China. **Philip.**

The "Daily Mail" commercial map of China, showing the railway concessions, coalfields, iron-mines, navigable waterways, and steamship routes. Scale 1 : 7,750,000 or 120 stat. miles to an inch. George Philip & Son, London & Liverpool, 1898. *Price* 1*s. Presented by the Publishers.*

AFRICA.

French Congo. **Courtry.**

Carte du Congo Français et Haut Oubanghi. Scale 1 : 800,000 or 12·6 stat. miles to an inch. Par A. Courtry: Paris, 1897-98. 12 sheets.

The large scale on which this map is drawn renders it specially useful for reference. It is confined entirely to the basins of the Congo and Ubangi, and does not include any of the Bahr-el-Gazel province. The principal routes of explorers are laid down, and some statistical information with regard to navigation is given.

AMERICA.

Paraguay. **Romero.**

La République du Paraguay. Scale 1 : 1,580,000 or 24·9 stat. miles to an inch. By Cleto Romero. Bruxelles: E. Guyot, 1897.

This map was prepared for the International Exhibition of Brussels, 1897. The importance of towns is indicated by the symbols employed to mark their positions, and all railways and telegraph lines in operation, as well as those in the course of construction, are shown. An inset plan of Asuncion is given on an enlarged scale. At the back of the map there are notes containing statistical information.

AUSTRALASIA.

Queensland. **Survey Department, Brisbane.**

Map of Queensland. Scale 1:3,041,280 or 48 stat. miles to an inch. Survey Department, Brisbane, 1898. *Price* 2*s.* 6*d. Presented by the Surveyor-General of Queensland.*

GENERAL.

World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 139 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Lief 39, Südbayern, Tirol und Salzburg.—Lief 40, Schweiz.—Lief 41, Kolonial-und Weltverkehrskarte.—Lief 42, Uebersichtskarte von Afrika. Bielefeld und Leipzig: Verlag von Velhagen and Klasing, 1898. *Price 50 pf. each part.*

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. In 20 parts, issued fortnightly. Part 20. Price 6*d.*

With the issue of part 20 this atlas is complete, and contains altogether 120 maps, and many insets. It is a new and revised edition of Bartholomew's Library Reference Atlas, and has been issued with great regularity, in twenty fortnightly parts, at sixpence each. The price of the whole atlas, with the binding, is sixteen shillings, which, considering the excellence of the maps and the copious gazetteer which accompanies it, is remarkably cheap.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1898. *Presented by the Hydrographic Department, Admiralty.*

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(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2424	Valentia to cape Clear.	New chart.	
1996	Mizen head to Kinsale.	Valentia to Kinsale	2424
883	Plan of approaches to Ekersund on this sheet.	New Chart.	
		Haadyret to Rauna	3007
2333	Plans of Port Novoi Zemli and Vaida bay on this chart.	New Chart.	
		Plans on the north coast of Russian Lapland	2967

No.	Cancelled by	No.
1565 Sops arm.	New chart. Sops arm	1565
678 Plan of Rondeau harbour on this sheet.		
2871 Boston harbour.	New chart. Boston harbour	1516
1302 Plans of Totoralillo bay and port of Huasco on this chart.	New chart. Anchorages on the coast of Chile	2938
1278 Plan of Iquique road on this chart.	New chart. Iquique	2093
601 Plan of Isles do Los on this chart.		
1235 Mouth of the Euphrates.	New chart. Mouth of the Euphrates	1235
1293 Approach to Makassar.	New chart. Approach to Makassar	1293
1988 Sam sa bay and inlet.	New chart. Sam sa bay and inlet	1988
16 Hyogo and Osaka.	New chart. Kobe and Osaka	16

Charts that have received Important Corrections.

No. 2280, White sea:—Arkhangel bay. 300, Anchorages on the west and north coasts of Spitsbergen. 2361, Sweden:—Öland to Landsort. 2296, Gulf of Bothnia:—South Quarken to Hornslandet. 2331, Gulf of Finland:—Hangö head to Barö sound. 1345, France, west coast:—St. Jean de Luz. 2647, France, west coast:—Les Sables d'Olonne to Bourgneuf. 2646, France, west coast:—Borgneuf to Ile de Groix. 194, Malta and Gozo islands. 2996, Black sea:—Karkinitskago bay. 2282, Arctic ocean and Greenland sea. 296, Newfoundland:—Cape Bonavista to Bay Bulls. 678, Lake Erie and Huron. 1302, Plans on the coast of Chile. 1876, Anchorages on the coast of Mexico. 2449, British Columbia:—Lama passage and Seaforth channel. 2431, Alaska:—Port Simpson to Cross sound. 1013, Africa, west coast:—Cape Lopez to Cape of Good Hope. 601, Africa, west coast:—Isles do Los to Sherbro island. 685, Africa, east coast:—Bazaruto bay, Limpopo river. 721, Seychelles group. 42, India, west coast:—Coasts of Sind and Kutch. 829, India, east coast:—Cocanada to Bassein river. 814, Bay of Bengal:—The Sandheads. 2636, Strait of Makassar, north part. 403, Australia, south coast:—Wood point to Lowly point. 401, Australia, south coast:—Port Augusta.
(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for December, 1898. Published at the Hydrographic Office, Washington, E.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Alaska. **Burls.**

Five Photographs of the Robinson Range, Alaska (Mounts Dalton, Redwood, and Campbell), taken by H. T. Burls, Esq., 1898. *Presented by H. T. Burls, Esq.*

These five photographs are enlargements, and illustrate the scenery and geology of the Robinson range, Alaska. The following are their titles:—

(1) Mount Redwood, with Johnstone creek in the foreground; (2) Mount Redwood, about 6 miles west from Icy cape; (3) Mount Redwood, showing glacier becoming extinct at foot; (4) Mount Campbell; (5) Mount Dalton.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

CHRISTMAS ISLAND

Partly from a survey by

C.W. ANDREWS, F.G.S.

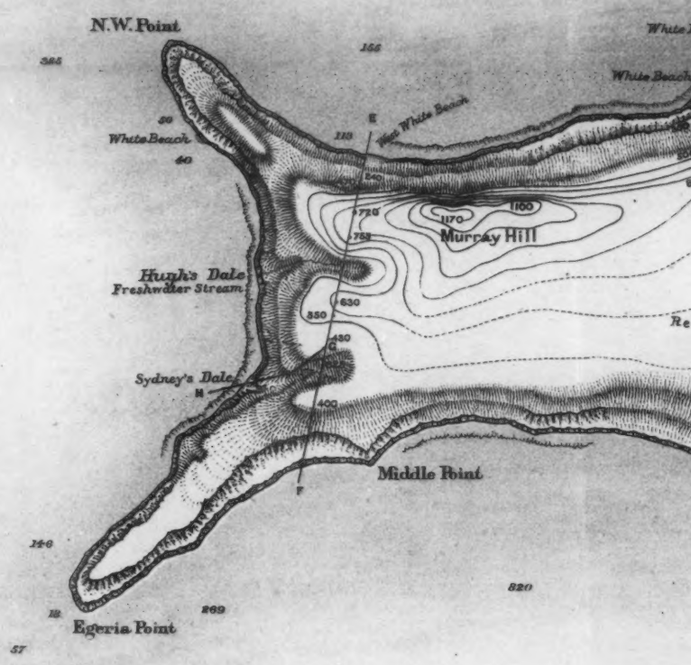
1897-98.

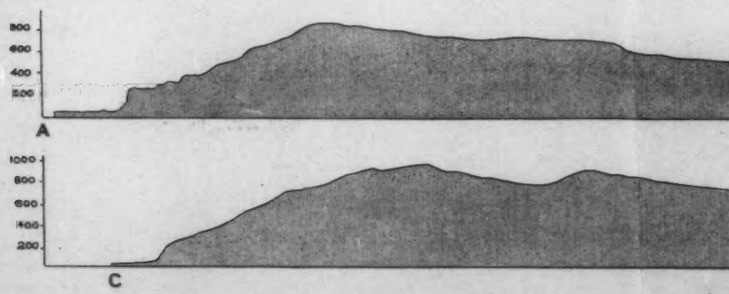
Scale of Miles

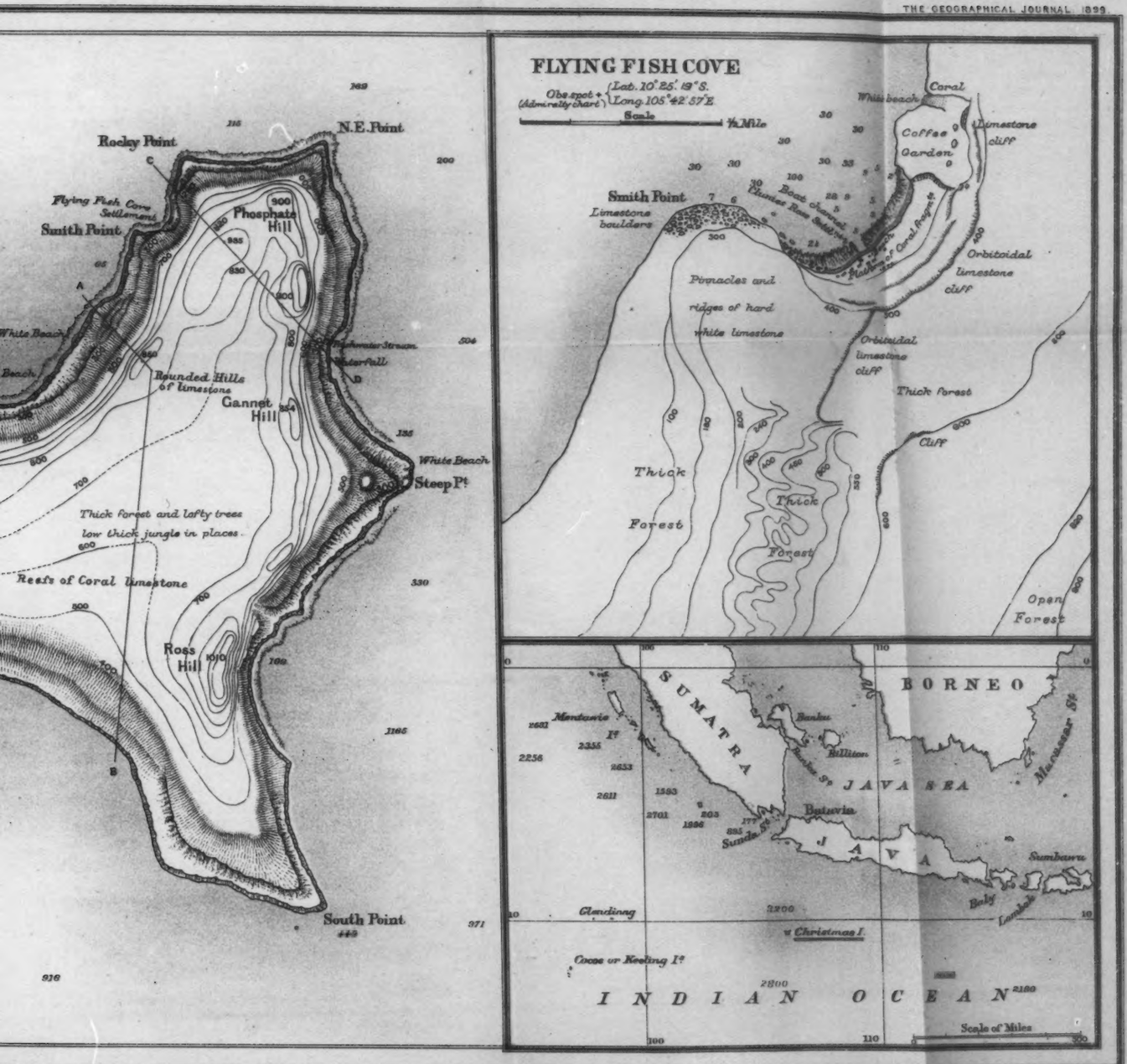
0 5

Nat. scale 1:100.000 or 1·58 miles - 1 inch

Heights in Feet. *Depths in Fathoms*







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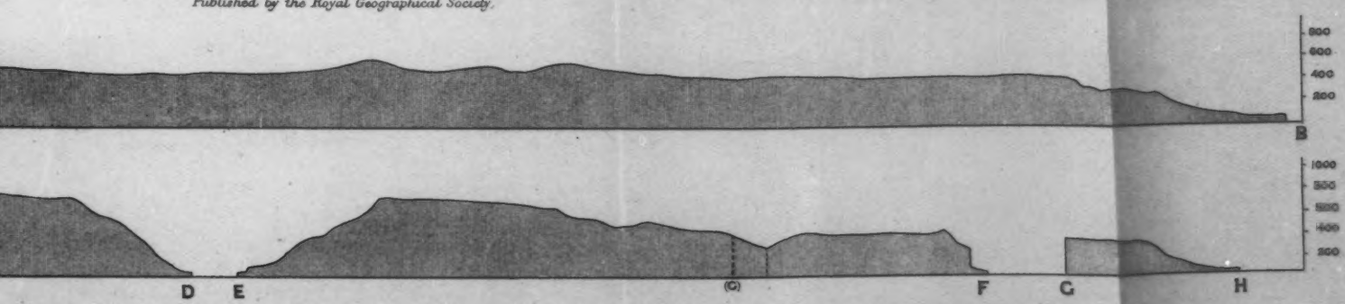
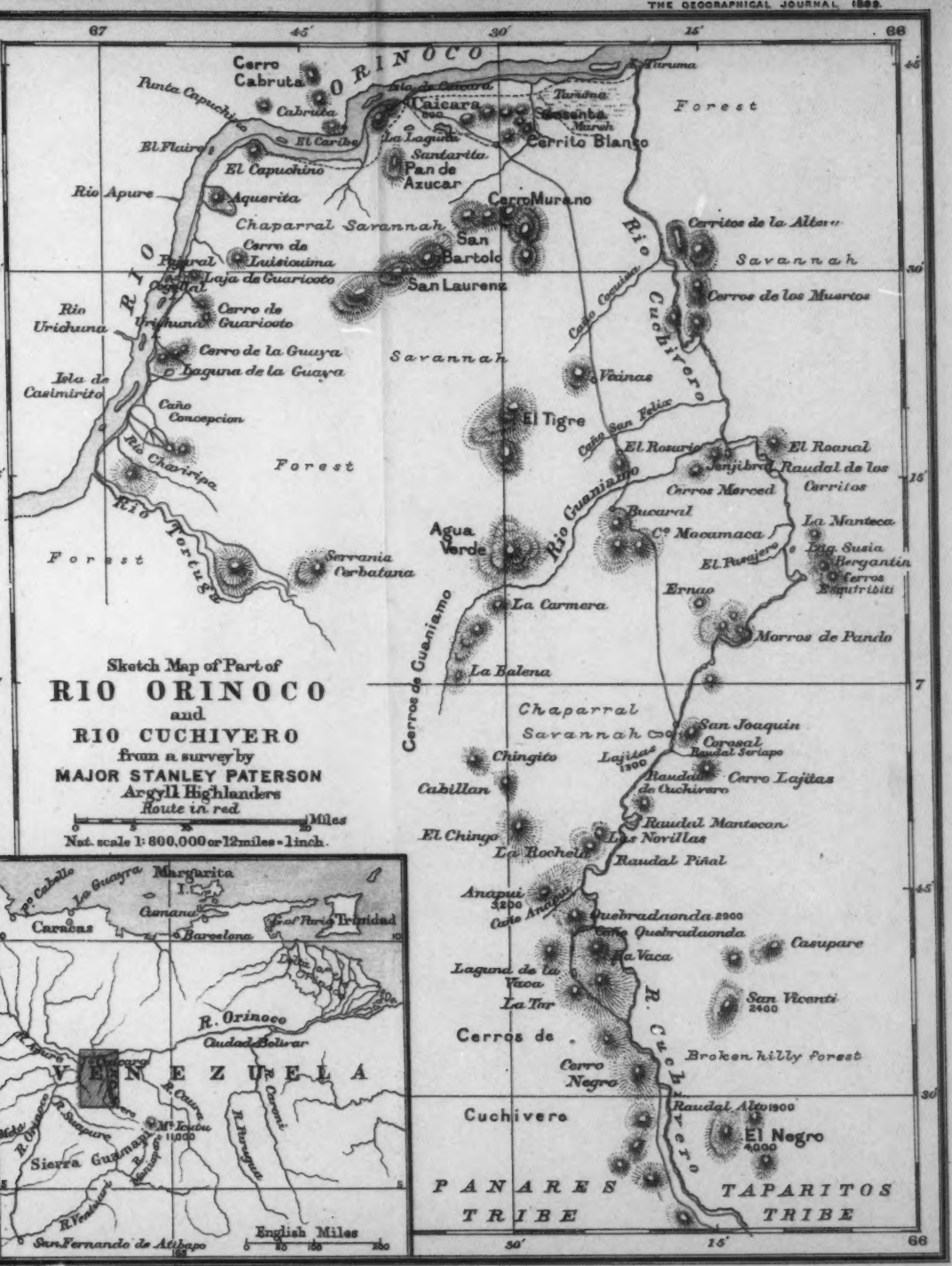


Horizontal Scale 1·6 inches = 1 mile.



Published by the Royal Geographical Society.

MAP

OF THE

SHIRE HIGHLANDS

DISTRICT OF BRITISH CENTRAL AFRICA

COMPILED AT

The Survey Department
of the Protectorate Administration

BY

Mr W. STOTESBURY & Surveyor WAHID ALI KHAN

UNDER THE DIRECTION OF

Mr W. ANDERSON

Scale

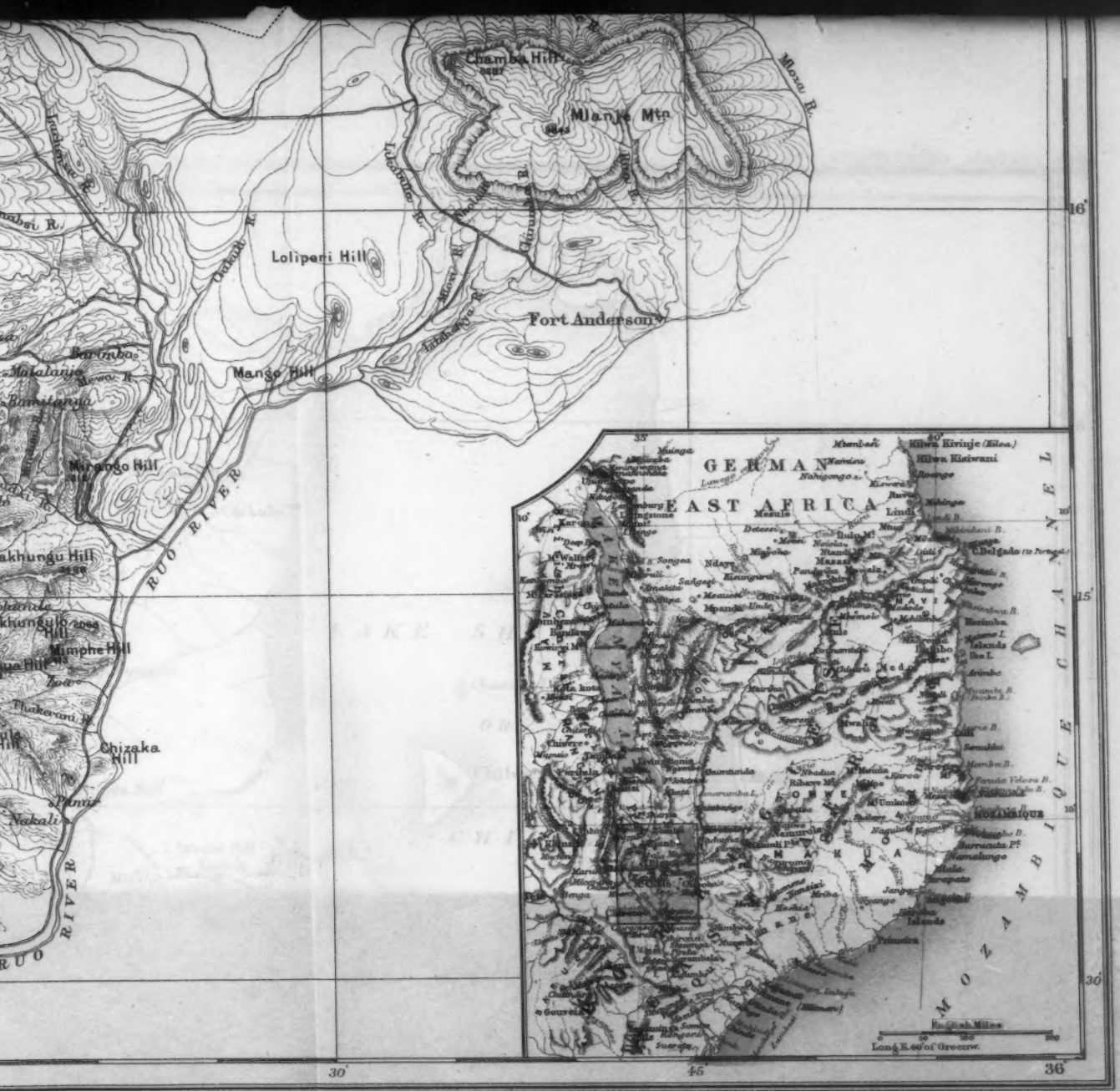
5 0 5 10 15

1 : 400,000 or 6 Miles = 1 Inch

15′ 30′ 45′ 36′

Liwondi
Sharp
Chikala Hill
Chaoni Hill
Chikala R.
Bango Hill
Chipdozi Hill
Makongolo R.
Mapingiri
Molosa Mtn
Milinda Hill
Sakata Hill
Zomba Mtn
ZOMBA
Mcol
Churanga
Kuphana
Mariro
Chimachuma
Chimasa
Matoiyan Hill
Matoiyan Rk
Namitengu Hill
Mazireni Hill
Chesugulu Hill
Zanje Hill
Mlomba Hill
Namatunu Hill
Maengi Hill
Mikomwe Hill
Mausi Hill
Mlamyam
Tongwe I.
LAKE SHIRWA
Chanda I.
OR
Chilwa I.
CHILWA
Njalo I.
Mkangala
Nzozomera
Mkulu
Ana Mtapa
Mlolo
Mwiriyi
Tuchila Plain
Chikoya Hill
Ngulu di Hill
Port Lister
Chamba Hill
Mlanje Mtn
Lolipani Hill
Fort Anderson
Mango Hill
Pachesoka Hill
Nkawa Hill
Mpyogo Hill
GERMAN EAST AFRICA

Hamilton Falls
Nkokwe
Chirala
Gungus Hill
Mtami Hill
Gombwa Hill
Kambera Hill
Pachesoka Hill
Mekala Hill
SHIRE RIVER
CHIKWAWA
Kalubwa Hill
Nkawa Hill
Cholo Hill
Mwanganti Hill
Maperera
Limba
Mabuli Hill
Makwira
Malindala
Pachesanya
Malonga
Chilenga Hill
Mchenga
Nambira Hill
Masongoze
Sambanenja Hill
Nambula Hill
Gombwa
Mikangwa Hill
Pandogo Hill
Namalusi Hill
Gandu
Mchagha
Mbengwa
CHIROMO
16°
15°
30'
45'
35'
15'



30 45 36

W. & A. K. Johnston, Lithographers, Edinburgh & London.

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